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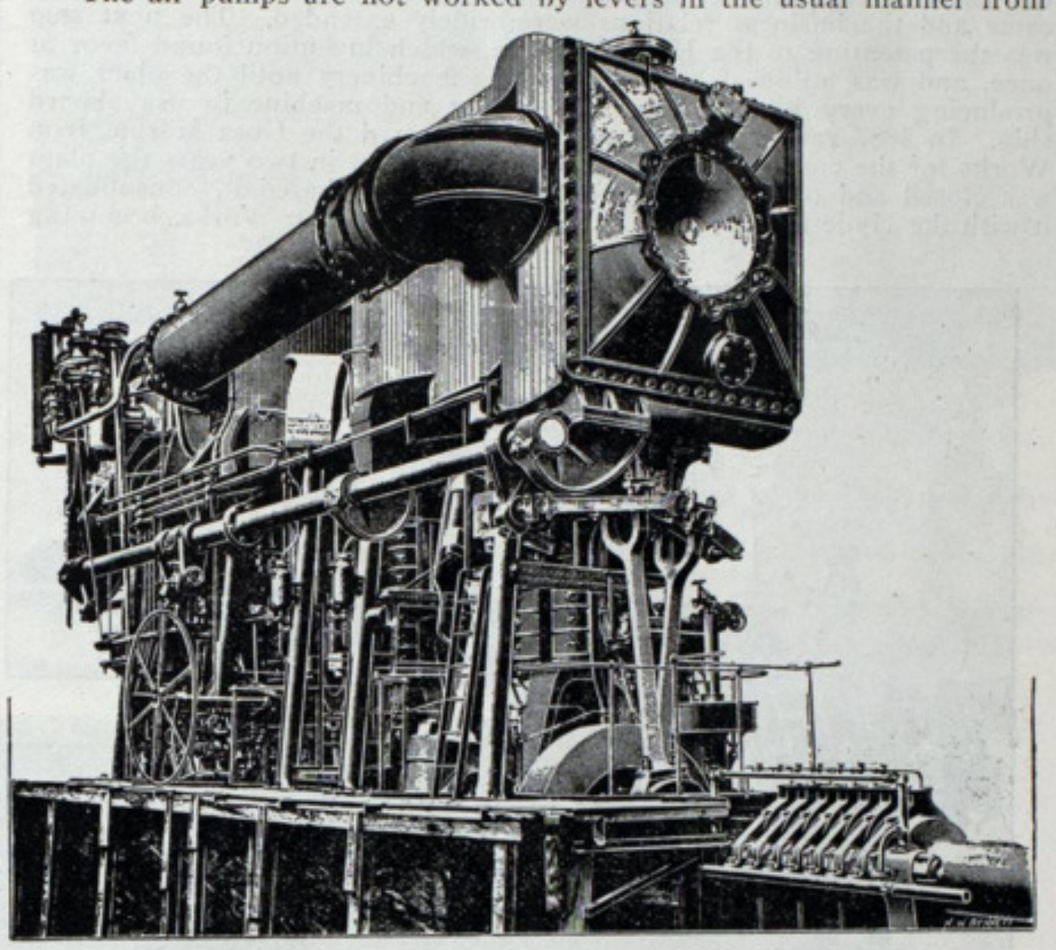
ENGINES OF THE ASAHI.

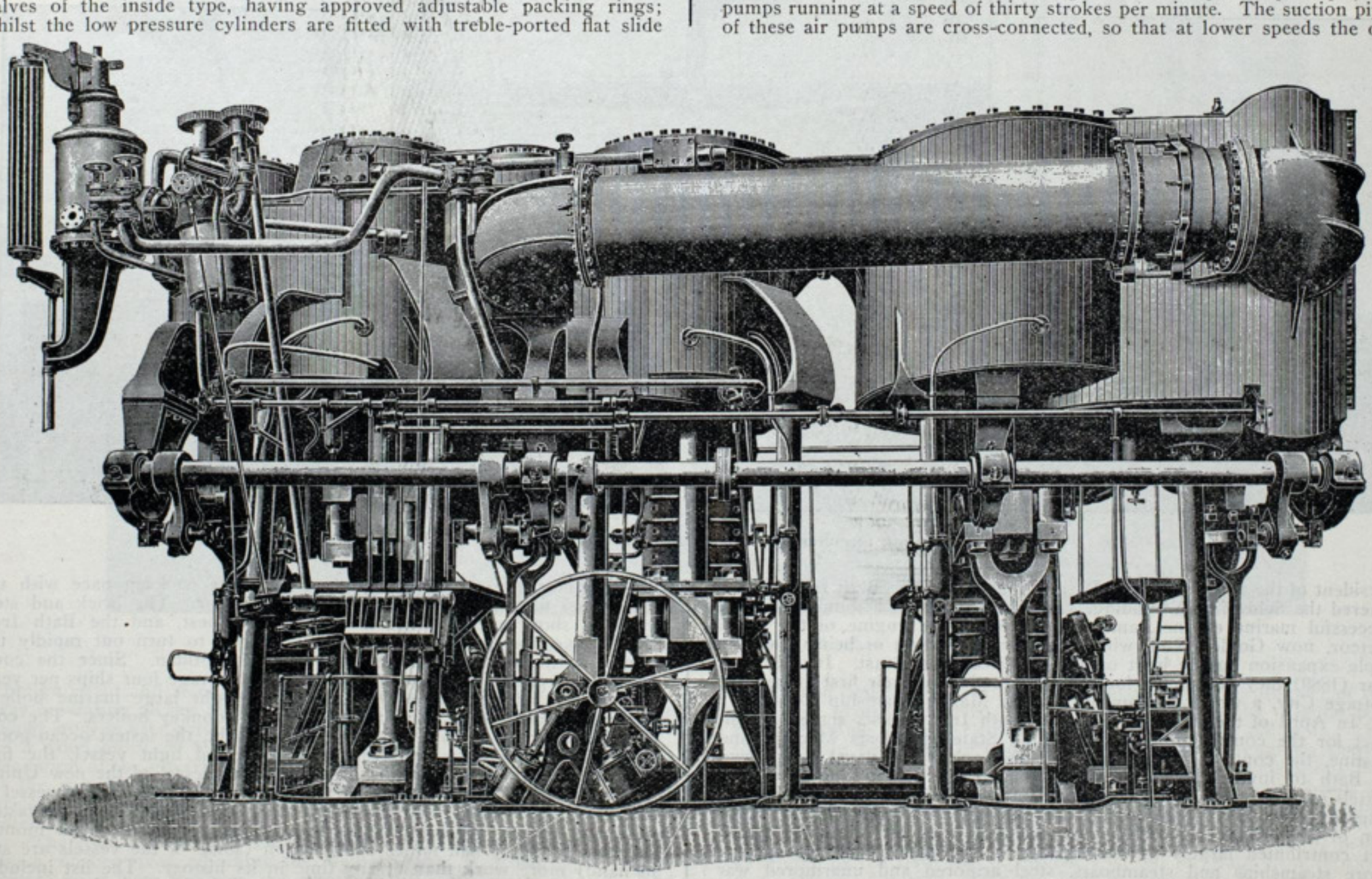
A JAPANESE BATTLESHIP (LARGEST IN THE WORLD) OF 15,200 TONS DISPLACEMENT, 16,360 HORSE POWER AND 18.3 KNOTS SPEED.

Two views of the three-cylinder triple expansion engines of the Japanese battleship Asahi, built recently by John Brown & Co. of Clydebank, Glasgow, Scotland, are presented on this page. The illustrations are reproduced from Engineering of London. Aside from a description of these engines, it may be noted that the Asahi is the largest battleship in the world, and that the Japanese navy now consists of ninety vessels of all classes, comprising ten first-class battleships, ten first-class armored cruisers, twenty fast protected cruisers and the remainder torpedo boat destroyers and small gunboats, all of the latest design. The Asahi is very much like vessels of the British Formidable class. Her principal dimensions are: Length over all, 425½ feet; length between perpendiculars, 400 feet; breadth, extreme, 75 feet; depth, moulded, 43½ feet; normal mean draught, 27 feet; displacement, 15,200 tons. The armament includes four 12-inch guns mounted in pairs fore-and-aft, and fourteen 6-inch quick firing guns, eight on the main and six on the upper deck. There is quite a host of small guns, among them twenty 12-pounders, eight 3-pounders, four 2½-pounders and several Maxim rifles.

The Asahi is propelled by two sets of three-cylinder triple expansion engines. Each of the two sets is designed to develop 8000 indicated horse power, giving a combined indicated power of 16,000. Steam is supplied by water-tube boilers of the latest Belleville economizer type, working at a pressure of 300 pounds per square inch, which will be reduced at the engines to 250 pounds. Each set of engines is placed in a separate engine room, divided by longitudinal watertight bulkhead, which extends the whole length of the machinery space. Each engine room is in all respects similar to but entirely independent of the other. The main engines are of the vertical inverted type, supported on cast-iron columns at the back, and inclined wrought-steel columns at the front. The soleplates, or main bearing frames, which are made of the cast-steel skeleton type to insure lightness, are strongly bolted together so as to form one homogeneous stiff foundation for the engines. All the cylinders are fitted with separate liners, and are steam-jacketed. The diameter of the high pressure cylinders is 32½ inches; that of the intermediate pressure cylinders, 52 inches; and that of the low-pressure cylinders, 85 inches; all having a stroke of 4 feet. The high and intermediate pressure cylinders are fitted with piston valves of the inside type, having approved adjustable packing rings; whilst the low pressure cylinders are fitted with treble-ported flat slide valves, having a special type of relief frame fitted at the back to relieve them of steam pressure. The weight of all the valves is suitably balanced in order to reduce the strain on the valve gear as far as possible; the latter is of the double-eccentric link-motion type. The cylinders, which are entirely independent castings, are connected together by attachments which, while allowing for the expansion of the different parts, insure, at the same time, longitudinal stiffness; and to further increase their stability in the event of ramming, etc., strong struts are fitted between the high pressure engine and the forward structure of the vessel, as well as traversely between the respective cylinders in each engine-room.

The air pumps are not worked by levers in the usual manner from the main engines, but are entirely separate. Close under the main condensers are placed a pair of direct-driving, single-acting air pumps, actuated by steam cylinders working on the compound principle, the pumps running at a speed of thirty strokes per minute. The suction pipes of these air pumps are cross-connected, so that at lower speeds the one set of pumps suffice for both engine rooms, which may prove of great advantage in the event of accidents. The main condensers, which are built of riveted brass plates, are placed in the wings of the ship and have a collective cooling surface of 16,000 square feet. Adjacent to them, at the aft engine room bulkhead, are placed two auxiliary condensers, one in each engine room, having a combined cooling surface of 2220 square





(Continued on page 25.)

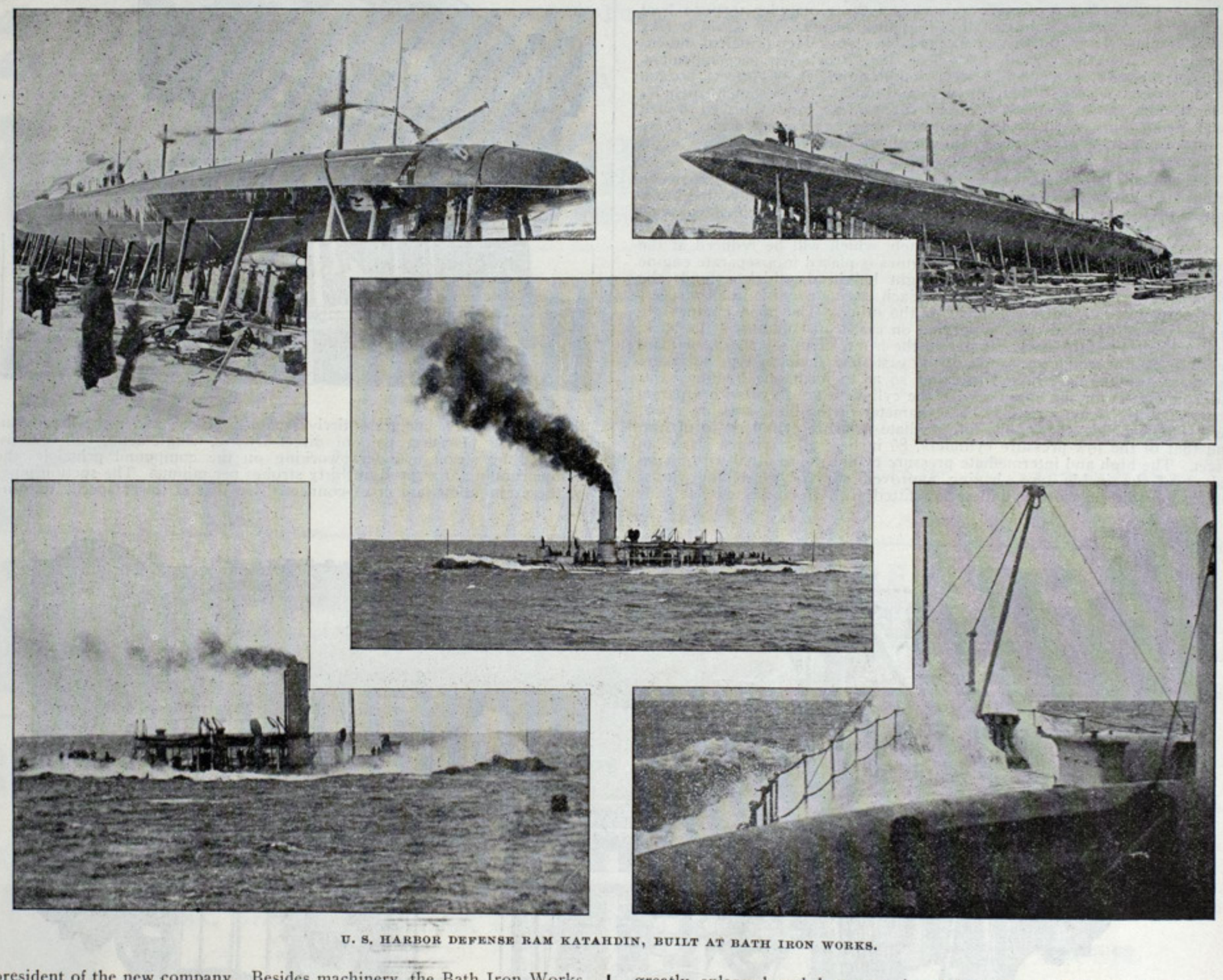
BATH IRON WORKS, LTD.

THE DEVELOPMENT OF A GREAT INDUSTRY IN THE COURSE OF A SINGLE DECADE —A SKETCH OF ITS HISTORY AND A DESCRIPTION OF THE PLANT.

At the close of the civil war, Gen. Thomas W. Hyde returned to Bath, Me., his native city, and entered the iron industry by the purchase of a small, almost unknown, foundry on Water street. At first the sole business was the making of simple castings, but Gen. Hyde, applying the same peculiar ability as distinguished him in every field, rapidly improved and enlarged the sphere of work. New machinery was added, the class of castings bettered and quantity increased, a machine shop came and the business relations were widely extended. The next step was the patenting of the Hyde windlass, which invention found favor at once, and was followed by other marine machinery until the plant was producing every kind of auxiliary engine and machine in use aboard ship. In 1887 various Bath capitalists organized the Goss Marine Iron Works for the construction of marine engines, but in two years the plant was closed and offered for sale. Gen. Hyde purchased it, consolidated it with the Hyde foundry, and organized the Bath Iron Works, becoming president of the new company. Besides machinery, the Bath Iron Works entered the field of ship building. The company built a number of very successful marine engines, among them being the engine of the yacht Meteor, now Golden Rod, which has the distinction of being the first triple expansion engine built on the American east coast. In the same year (1889) they contracted for the construction of their first vessel, the Cottage City, a wooden steamship for the Maine Steamship Co.

In April of the following year the Bath Iron Works signed a contract for the construction of the United States gunboats Machias and Castine, the contract price being $318,500 each. The naval board sent to Bath to investigate the plant and facilities for building steel war vessels reported very favorably and the future of Bath Iron Works seemed assured. Gen. Hyde displayed remarkably good judgment in the selection of his staff of superintendents, technical men and foremen, which fact contributed largely to the rapidity of the growth and prosperity. More steamships and steamboats, steel armored and unarmored war vessels, steam yachts and passenger steamers were contracted for and successfully built.

The gunboats Machias and Castine, the first steel vessels built by the company, hold the record for greatest excess speed obtained above the contract requirements of any vessel in the United States navy. The former exceeded her contract speed by 2.464 knots and the Castine by 3.032 knots, while the Long Island sound twin-screw steamer City of Lowell flies the pennant today of the fastest vessel on the Sound. In 1894, the year the City of Lowell was built, the steel steam yacht Eleanor, pictured in these columns two weeks ago, was also under construction, at that time the largest American-built steam yacht, as well as the United States armored ram Katahdin. It was while these vessels were under way that the shops of the concern were almost completely destroyed by the most serious night fire that ever occurred in Maine. The two following years, 1894-1895, were the dullest in the history of American steel ship building, but the company building small yachts and light vessels were enabled to pass successfully through the great misfortune and trouble caused by the severe fire and hard times. The plant was then gradually rebuilt. Instead of wood buildings of so-called slow burning construction, fine steel ones were erected, and the only new wood buildings of the company are the joiner, carpenter and paint shops. Towards the end of 1895 the Bath Iron Works contracted for the construction of their fifteenth and sixteenth vessels, the United States gunboats Newport and Vicksburg, and less than a year later they were awarded the contract for the construction of Dahlgren and Craven, America's first 30-knot torpedo boats. Light-ships and light-house tenders, cargo steamships, steam yachts and sailing vessels were contracted for in rapid succession, the result being the plant had to be greatly enlarged and better equipped in order to keep pace with the amount of first-class construction contracted for. The brick and steel machine shop recently built is one of the finest, and the Bath Iron Works has now a plant of sufficient capacity to turn out rapidly the largest battleship, armored cruiser, or merchantman. Since the company was organized it has constructed on an average four ships per year, five or six marine engines, and seven or eight large marine boilers, excluding repair work, auxiliary engines and donkey boilers. The concern has built the largest American steam yacht, the fastest ocean-going steam yacht, the first composite electric-lighted light vessel, the first American cargo steamship, the first composite vessel of the new United States navy, the first American sheathed vessel, the only sailing vessel of the new United States navy, the fastest American torpedo boat, the fastest passenger steamer plying on American waters, etc. Just a few months ago this company had under construction (some of the vessels are still in hand) more work than at any time in its history. The list included an armored monitor, a sheathed cruiser, and five torpedo boats for the United States navy, a large steam yacht and two powerful tow boats, a total of ten vessels, with an aggregate displacement of 10,000 tons, a total power of 33,000 horse power, and a valuation of about $3,500,000.



U. S. HARBOR DEFENSE RAM KATAHDIN, BUILT AT BATH IRON WORKS.

THE HYDE WINDLASS CO.

The old Hyde foundry, which was changed in 1889 to the north division of the Bath Iron Works, has developed gradually into an inde-

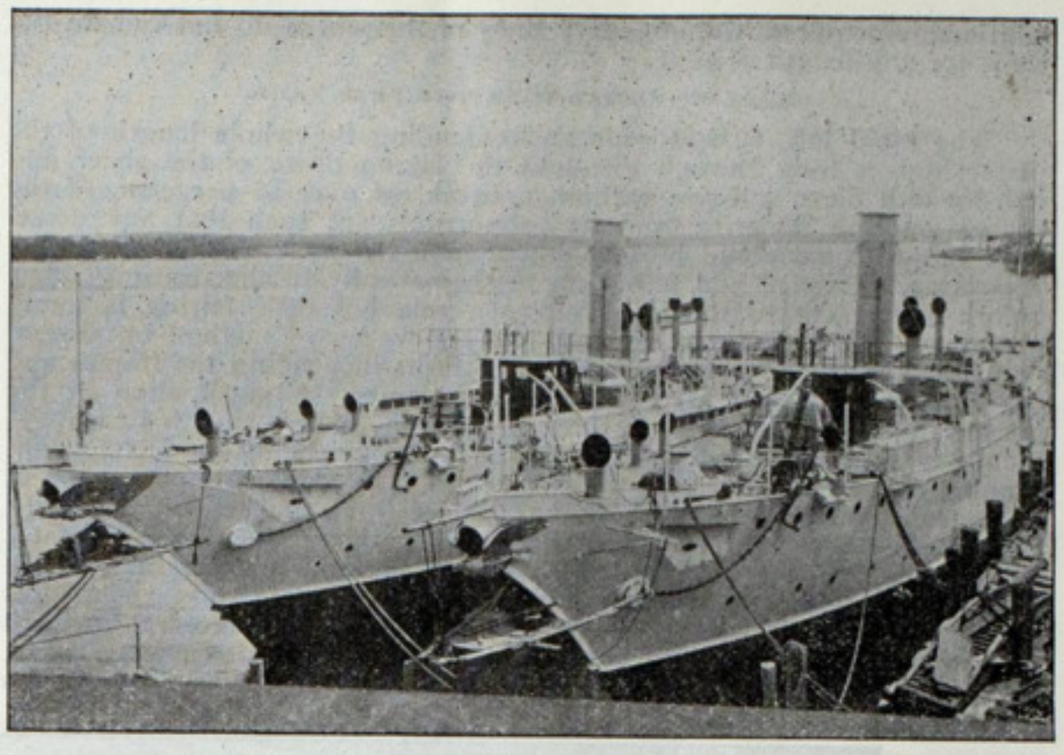
pendent concern, which, under the name of the Hyde Windlass Co., has long since outgrown and deserted its old quarters and now occupies a plant almost as big as that of the iron works itself. This plant is located on the west bank of the Kennebec river, one-quarter mile south of the Bath Iron Works, and is engaged principally in the manufacture of the Hyde steam windlass. The Hyde manganese bronze, made by the Hyde Windlass Co., is claimed to be superior to all others both as to tensile strength and ductility, and it is much used for propellers and heavy and light ship castings. Gen. Hyde developed the Bath Iron Works and Hyde Windlass Co. to their present magnitude, but, owing to ill-health, he was obliged to retire from their active management two years ago, and in September, 1899, he resigned from all connection with the concern. Edward W. Hyde, the founder's son, was elected president in his stead, and John S. Hyde, another son, vice-president. On Tuesday afternoon, Nov. 14, 1899, Gen. Thos. W. Hyde breathed his last at Hotel Chamberlain, Old Point Comfort, Va., and his death, which was a great blow to his family, his friends, his city and his state, removed one of the ablest, truest and noblest of men. The Bath Iron Works is a monument of his business ability, but besides a business man he was a soldier, financier, statesman, literateur and scholar, in each of which divers capacities did he brilliantly distinguish himself.

Although the Bath Iron Works is only ten years old, there is not one of the original shops standing today. In a period of ten years the area of the plant has increased 100 per cent. The plant is constantly in the various stages of expansion, and new land is being acquired, new modern buildings erected and first-class machines are being supplied year by year. We give below a summary of the principal features of the plant and works as they stand at present:

PRINCIPAL FEATURES OF THE BATH WORKS.

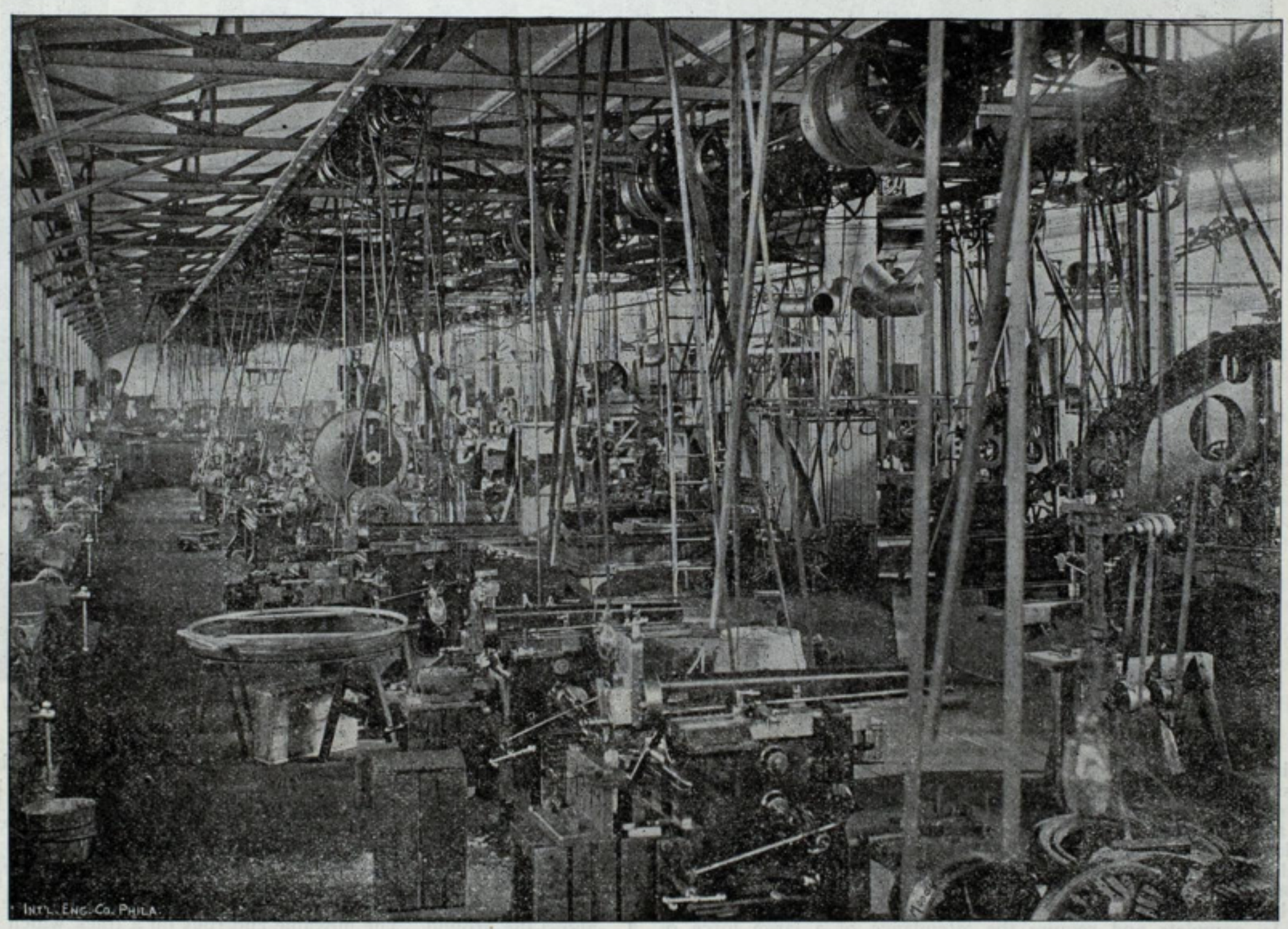
The buildings and shops are all new and modern, constructed of steel, brick and wood. There are thirty-seven shops well arranged and located in twenty-six buildings. The main office of the company is on the lower floor of a splendid new brick building about 70 feet long and 50 feet wide. The president, vice-president, general superintendent, purchasing agent and stenographers have offices on the lower floor, a hallway separating all but the president's office from the general office. The upper story is used principally by the hull draughtsmen. The lower floor of a wood office, 90 feet long and 30 feet wide, is used for the accommodation of the government officials and inspectors, and the upper story is the engine draughting room of the company. Various small offices are located throughout the works for the accommodation of the leading foremen.

The company owns eleven acres of good upland on the west bank of the Kennebec river, adjoining the Maine Central Railroad depot, twelve statute miles from Popham, the mouth of the Kennebec river. The land is almost a square with 700 feet sides. Five branch railroad tracks from the Bath freight depot make the railroad facilities almost ideal. The land owned by the company has a water frontage of 700 feet, one-half of which is utilized by ship building ways, the other half being well wharfed out and made suitable for the operation of the business. There are two large wharves and one small one, all of which project into deep water. The largest vessel afloat can steam up the Kennebec river to the works of this company, and be moored in deep water to the wharves above mentioned. The river opposite the works is fully a mile wide. It is never frozen over, and vessels can be launched at any season of the year, and when completed leave port.



UNITED STATES GUNBOATS NEWPORT AND VICKSBURG, BUILT AT BATH IRON WORKS.

All the machines and tools of the concern were originally operated by steam, the source of motor power being centralized in a substantial engine and boiler house. As the plant enlarged and the number of shops and tools greatly increased, it was decided to keep the original power plant the same and use electric motors for all power additions. Therefore, besides two large locomotive boilers and steam engines, there are today sixteen large electric motors located in the various shops of the plant, the collective power of all the engines and motors being 1,100 horse power. A complete hydraulic and pneumatic plant for operating ship yard and boiler shop tools is now in operation. Electricity for power motors, and also for lighting the offices and shops of the plant, is generated by the Bath Gas & Electric Co., but the Bath Iron Works has two powerful dynamos which are kept in reserve to be used in case of any break-down at the city electric works. The plant is fenced off on three sides, and, excluding the water front and car track, entrance can only be afforded by means of the general office and two gates, one on the north and the other directly opposite on the south side of the plant. In working hours, the gates are used only for teams. All employes entering the yard obtain a brass check at the north gate house, which they return to the house on leaving the yard. As more land is being almost



INTERIOR OF ENGINE MACHINE SHOP, BATH IRON WORKS.

continually acquired, the boundary lines of the works do not remain the same for any length of time.

SHOPS CONNECTED WITH THE SHIP YARD.

The mold loft, 60 feet wide and extending the whole length of the plate shop, is long enough to admit the laying down of the sheer and half-breadth plans full-size without a break, of over 95 per cent. of the vessels built in America, and its proportions are such that any vessel built or projected could be laid down upon its floor. The lines of the vessels are designed and faired up mathematically in the drawing office before being sent to the loft, and as a rule but little fairing is found necessary. The company has used the scrieve-board method on several occasions, but wooden molds used as patterns in bending the frames and other shapes seem to give much better results. A small shop in the corner of the loft is used by the hull pattern maker, and this arrangement gives excellent satisfaction, as the hull pattern maker has to continually consult the lines on the loft floor. The ship yard plate shop is a fine, new substantial steel building, 340 feet long and 60 feet wide. In this shop is to be found all the latest machinery for working ship plates and shapes, such as punches, shears, plate planers, countersinks, drills, cold saws, mangle rolls, frame-bending machines, plate rolls. The tools are operated by electricity, two powerful motors being fitted. Attached to this shop is the bending shed, a lofty steel building, 60 feet square, with open south front and projecting weather shield. The floor of this building is covered with heavy cast-iron blocks upon which the frames of the vessels building, and the various shapes which enter into the construction of a ship are bent and shaped. Adjoining the north end of this building are the large plate and angle furnaces, and the angle-smith shop, which is well equipped. As this company installs electric plants in the vessels they build, which include lighting, interior means of communications, etc., and as the entire works is lighted and principally operated by electricity, it is quite apparent that this department must of necessity be complete and require the attendance of a large force of skilled mechanics. A complete telephone system, with a central station in the north gate house, was recently fitted throughout the plant.

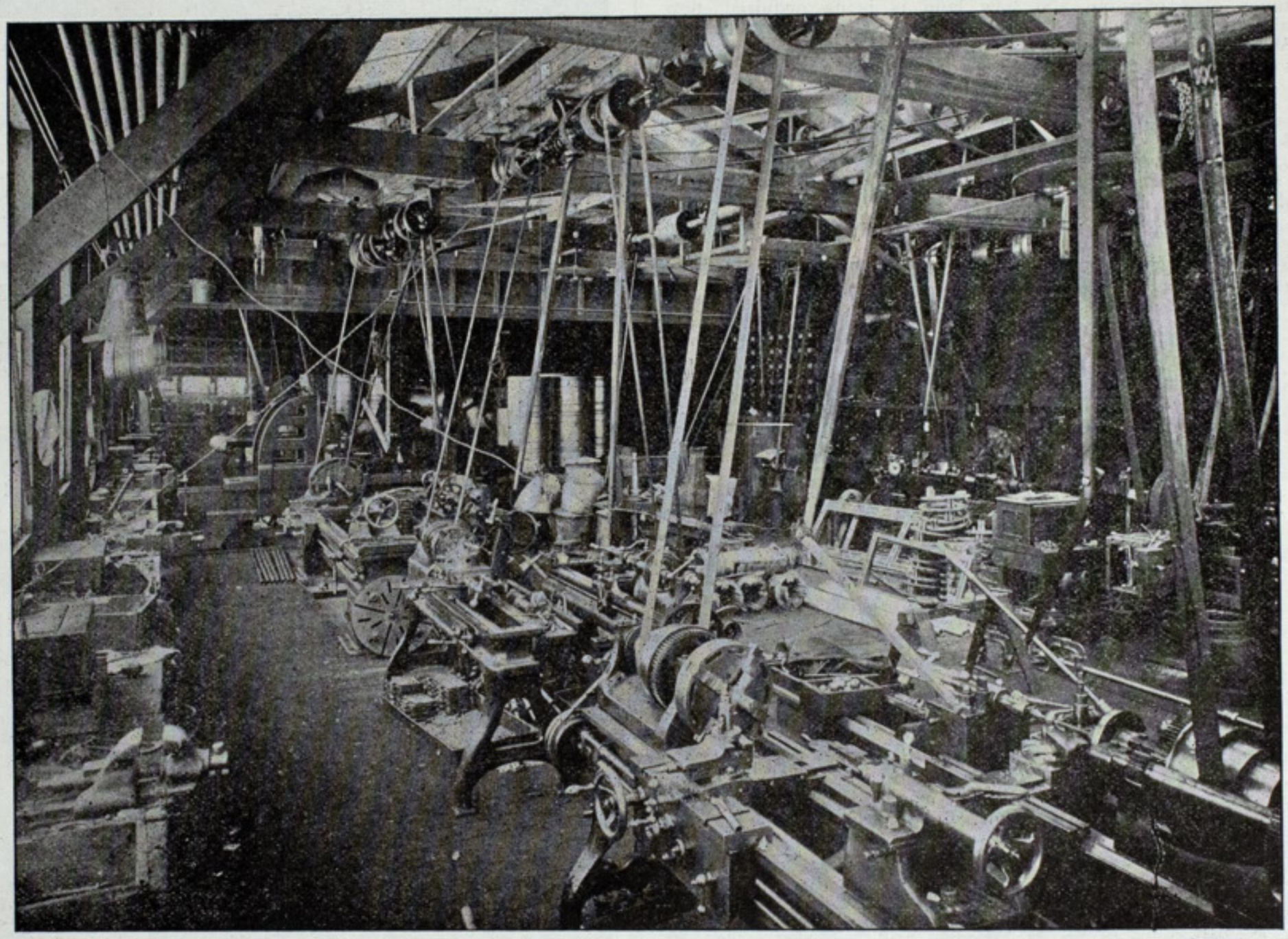
The blacksmith shop is a large, commodious building, 180 feet long and 60 feet wide. It is well equipped with heavy and light steam hammers and a large scrap furnace. Over the latter a steam boiler is placed, the escaping gases being thus utilized for making steam to run the hammers and heat the joiner, carpenter and pattern shops. The shop is supplied with a 35-horse-power motor which operates the forge blowers and small tools. There are twenty stationary forges, and the shop is provided with the best set of sledges to form and finish work that is to be found in this part of the country. Over one of the ship ways a large steel house has been erected, so that yachts and other high-class construction can be built at all seasons of the year, well protected from the weather. In this ship house has already been constructed the largest steam yacht built in America, and it is large enough to take even larger vessels. At the east end of the plate shop is a large steel building in which three torpedo boats or light, high-speed yachts can be constructed at the same time. The central portion of a wharf at this point is made portable to facilitate launchings. The shop is completely covered in and well heated. It is built entirely of steel, with large side windows, and part of the top is portable so as to allow the machinery to be placed on board the boats before they are launched. The foundries are large and well equipped and employ about 125 men when fully operated. A 20-ton electric crane travels the full length of the main building.

EQUIPMENT OF MACHINE SHOP, BOILER WORKS AND SHIP YARD.

Foremost among the tools come those in the machine shop, sixty-five of which are new and among which are some of the finest and most perfect specimens of the modern metal-working machine, such as lathes, planers, slotters, shapers, vertical and horizontal boring mill, milling machines of all descriptions, radial drill, etc. One of the planers in this shop will plane a mass of metal 10 feet by 10 feet by 26 feet outside dimensions; one of the boring mills will swing a 16-foot circle, and the largest radial drill has a 60-inch arm and is 10 feet high. This machine shop is 320 feet long, 100 feet wide and 49 feet high. It is equipped with a 40,000-pound Shaw electric traveling crane and two similar cranes of 10,000 pounds capacity. The shop is heated by the Sturtevant system of blowers, steam radiators and distributing ducts. The machines are operated by electricity, two 50-horse-power motors being fitted.

Material in the ship yard is handled in a very interesting manner. The railroad cars containing steel ship plates enter the yard and lay alongside a main trolley house. A curved track, arc of a circle, is located at the further end of the ship steel racks, the centre of the circle being at the trolley house. This cableway or trolley picks up a steel plate from a car and drops it in one of the plate racks designated. When the ship fitter desires to lay off the plate in the shop it is picked up by the trolley and delivered where required. After punching, shearing, planing, etc., the plate is taken a few feet to the foot of a second trolley house, where it is hoisted by an electrically-driven cableway and delivered to the required part of any ship building on the different ways. The cableway, or second trolley, is of large capacity. The cable span is over 300 feet long, one end of which is supported at the top of a steel mast 85 feet from the ground, and the other end is carried on a radial track of the same height above the ground. The movable end runs on a track which is, of course, the arc of a circle, the chord of the same measuring 320 feet. This cableway is capable of lifting the heaviest ship plate, beam and medium castings and forgings from the plate shop and delivering them to nearly any part of the building ways. The hoister is supported in a small house which is attached to the mast and is driven by a 30-horse-power electric motor. The ship yard machine shop is supplied with first-class lathes, planes, drill presses, radial drills, shapers, machine grinders, buffers, polishers and the various tools necessary for machining all ship fittings and marine hardware.

The boiler shop is a lofty, commodious building, 140 feet long and 110 feet wide. It is fitted up to handle the very largest work, and is provided with a hydraulic plant, using water at 1,500 pounds pressure per square inch. The pump is run by a 40-horse-power electric motor. In this shop there is an interesting series of machines, beginning with a 100-ton hydraulic riveter, and extending through a number of other powerful hydraulic tools, among which is a 50-ton riveter, a flanger with three 40-ton rams, any two of which can be combined, making 80 tons pressure upon any plate put in the machine; a large punch, capable of punching a 6-inch hole through the heaviest boiler steel, and a special tube bender for water tube boiler construction. The ordinary power tools, which are run by two electric motors, consist of punches, shears, cold



INTERIOR OF SHIP YARD MACHINE SHOP, BATH IRON WORKS.

saws, plate planers, countersinks and drills of various kinds, among which are special furnace drills and gang drills for boiler shells. Hydraulic cranes serve the hydraulic riveters and flangers, and the facilities for constructing and handling boilers are of the best.

The pneumatic power house contains a 100-horse-power electric motor, which runs a large duplex air compressor at a pressure of 80 pounds per square inch, which is piped to all parts of the plant where air pressure can be used, as well as the ship building ways for operating various types of riveters, hand, yoke and shell drillers, reamers, chippers and caulkers. The pneumatic tools do good, reliable work, and the number of them is gradually being increased. The lighter air pressure for rivet forges, etc., is supplied by blowers situated in the plate shop.

ATLANTIC AND PACIFIC COASTS.

REPORTS FROM NUMEROUS SHIP YARDS—CONTINUED ACTIVITY IN THE DIFFERENT DISTRICTS, ESPECIALLY AMONG BUILDERS OF WOODEN VESSELS.

The steel steamer American for the American-Hawaiian Steamship Co., was launched from the Roach's Ship Yard, Chester, Pa., last Saturday. The designs and specifications were prepared by Flannery Finton, naval architect, Liverpool, England. There are five ships of the same kind under contract and others are to be let. Three of these are being built at Roach's and two are being constructed on the Pacific coast. The general dimensions are: Length over all, 435 feet; beam, 51 feet; depth, 33 feet to water bottom; gross tonnage, 6,000. The vessels are all of the three-deck type, and two of the decks are plated with steel throughout. Machinery for the American consists of a vertical triple expansion engine having cylinders 27, 45½ and 76 inches diameter with 48 inches stroke, designed to indicate 2,500 horse power. Steam will be supplied by four large steel Scotch boilers, each 14 feet 9 inches in diameter and 10 feet 6 inches long, weighing about 45 tons each, working with natural draft and a common stack 80 feet high above the grates. A large donkey boiler, 9 feet 6 inches in diameter and 10 feet long, built for 90 pounds pressure, will also be supplied. The coal bunker capacity is 1,500 tons including the reserve bunkers. The American is designed to carry 8,250 tons of freight on a draught of 26 feet. Her mean speed, loaded, will be 10 knots per hour.

McKay & Dix have 120 men employed in their yard at Bucksport, Me., and are still short of help. The 1,400-ton four-masted wooden vessel upon which the firm is engaged is nearly ceiled up and the deck timbers are being put in place. Work is being rushed also on another wooden schooner which will have four spars but which will measure less than 800 tons. She is nearly ceiled up and a good start has been made on her planking which is of 5-inch hard pine. This over the 12 and 14-inch ceiling will make the vessel of great strength. She will be launched about Aug. 20. Work was begun last week on framing out the second four-master, an exact duplicate of the first, which for a number of weeks has been represented only by the stretched keel. It is understood that all three vessels will be launched before the first of November, which means that a great deal of work will have to be done in a very short time.

Three-masted wooden barge Grace for the Commercial Towboat Co. of Boston, was launched last week from the yard of Kelley, Spear & Co., Bath, Me. She is a sister barge of the Edith and Flora and is the fifth one built by Kelley, Spear & Co. for the Commercial company. The measurements are: 186.5 feet long; 35.3 feet breadth; 17.5 feet deep; 877 gross tons, 781 net. She has a carrying capacity of 1,600 tons. The Grace is the ninety-eighth craft built by Kelley, Spear & Co. They are employed on two schooners which make the list an even hundred. Of that number forty-three are barges. At the present time the only vessels under construction in the yard are a three-masted schooner for Capt. Hodgkins, which will be ready to launch July 20, and a four-masted schooner for J. S. Emery of Boston.

At the New England Co.'s yard, Bath, Me., with the four wooden schooners under way the scene is a busy one. Work is progressing rapidly on the three four-masted schooners and the five-master being built by the New England Co. The keel is stretched and the stern post up for the Capt. Kelsey schooner. The Capt. Potter schooner is half framed out. Riggers have commenced on the Drake schooner. She is half planked and the cabin work well along. She will be launched the last of the present month.

Three-masted wooden schooner Theoline, built by George A. Gilchrist, Belfast, Me., was launched last week. The new vessel registers 586 tons gross and 477 net. Her dimensions are: Length of keel, 158 feet; breadth of beam, 35½ feet; depth of hold, 13½ feet. The vessel is equipped with Hyde hoisting engine and steam wrecking pump.

A new steel tug for the Hartford & New York Transportation Co. has just been launched by the Columbian Iron Works & Dry Dock Co. at Baltimore. The new tug will be the largest of the company's fleet and will cost when completed about $35,000.

Sawyer Bros. of Millbridge, Me., are negotiating with Philadelphia and Baltimore parties for the construction of a five-masted wooden schooner of 1,400 tons register. They have nearly ready for launching the three-masted schooner N. M. Porcella.

George E. Currier & Son are progressing rapidly upon the vessels at their yard at Newburyport, Mass. The planking is nearly all on the first schooner and the keel for the second one is laid.

The Harlan & Hollingsworth Co., Wilmington, Del., recently launched the tugboat Abram Minis, which was built for the Propeller Towboat Co. of Savannah, Ga.

Torpedo boat Dale will be launched from the yards of the William R. Trigg Co., Richmond, Va., on July 24. The boat will be christened by Miss Wilson of Philadelphia.

Sylvanus Smith & Co. have contracted with John Bishop of Gloucester, Mass., for a new wooden schooner.

The Pusey & Jones Co., Wilmington, Del., has received an order for a new boiler for the tug Colon. The boiler will be of steel, of the Scotch type built to sustain a working pressure of 120 pounds. The Colon is a wooden tugboat and was constructed in 1890 by the Jackson & Sharp Co., Wilmington, for the Spanish-American Co. of New York.

ALONG THE PACIFIC COAST.

The steamer Iaqua for the Humboldt Lumber Manufacturers' Association has just been launched from the ship yard of H. D. Bendixen at Eureka, Cal. A barkentine, now on the stocks at this yard, is having her 12-inch bilge put in. The deck beams are in place and everything connected with her construction is progressing rapidly. Mr. Bendixen has orders for three more schooners and they will be begun as soon as room can be found for them.

Three wooden tugs are being constructed at the works of the Newell Mill Co., Seattle, Wash., for service in Puget Sound waters. One of them will cost $12,000 and the other $8,000. When the gold excitement occurred in the Klondike the Newell company began building light-draught vessels, and demonstrated that it could build them as well as anyone. Since that time the firm has built forty boats of various kinds.

The new four-masted wooden schooner Commerce, building at Hay & Wright's yard, Alameda, Cal., is nearing completion and will be launched early next month. She will be able to carry 900,000 feet of lumber. In the same yard a new steamer is being constructed for the Inter-Island Steamship Co. of Hawaii. She will be 172 feet in length, 36 feet beam and 14 feet in depth.

The Everett Ship Building Co. of Everett, Wash., has been organized with a capital stock of $100,000. It is the purpose of the company to engage in a general ship building business. A. Oscar Nelson and E. W. Heath are members of the board of directors.

AROUND THE GREAT LAKES.

The tug Drake will be rebuilt at Davis' dry dock, Kingston, Ont., and will go to Montreal. A new engine will be put in the tug.

Capt. John Donnelly, a well known lake captain and head of the Donnelly Wrecking Co., died Friday, at his home in Kingston, Ont.

The shipping of ore from the Michipicoten district on the Canadian north shore of Lake Superior above the Sault is expected to begin this week. The Algona Central Co. of Sault Ste. Marie, Ont., which is developing the mines and has built a railroad and docks, wants several hundred miners.

The Wilson line steamer Ravenscraig, built by the Jenks Ship Building Co., and which is of Canadian canal dimensions, recently took a cargo of 3,337 net tons of bituminous coal from Cleveland to Sheboygan, on a draught of 18 feet. This is certainly a large load for a steamer of canal size.

The board of supervisors of Houghton county, Michigan, has practically decided to replace the present center pier bridge on Portage lake with a new structure having a balance span, giving a channel of 173 feet in the clear in place of the two present channels of 63 and 64 feet, respectively. This improvement has long been urged by the marine interests.

Assistant Inspectors Judson and Pletes of the steamboat inspection service, Cleveland, have been selected to have charge of the Toledo district, which formerly was in the Cleveland district, but is now an independent local district in the ninth supervising district. The new office will have charge of steamboat inspection at Toledo, Sandusky, Port Clinton and Port Huron.

Several changes of masters in the Western Transit line are announced. Capt. John Davis, late of the steamer Chicago, will hereafter sail the steamer Boston; Capt. Henry Murphy, from the Montana to the Chicago; First Mate Frank Johnson of the steamer Mohawk is appointed master of the steamer Montana. Capt. Frank J. McCabe, who formerly commanded the steamer Boston, is dangerously ill at his home.

Capt. John Hartman, who has been in the freight steamer North Wind of the Northern Steamship Co., but who has had experience as first officer of one of the large passenger steamers of that line, has taken command of the passenger steamer North West, succeeding Capt. Geo. A. Minar, who will bring President James J. Hill's steam yacht, formerly the Eleanor, from the Atlantic coast. Capt. Hartman will be succeeded in the North Wind by Capt. Fred. Hart, formerly master of the steamer Bulgaria.

Capt. Albert Stewart, an old lake captain, died at his home in Detroit last week. He became master of the steamer Julius Morton on the lakes at the age of twenty-three years, having previously sailed around the world. Later he bought out the steamer Keeweenaw, next the propeller Minneapolis, for many years flagship of the Ward line, and at length went into the Detroit & Cleveland line, taking command of the old steamer City of Cleveland, now the State of Ohio. In 1893 he returned to the freighters, the Nicol and Viking being his ships. He was in many a storm, but never lost a boat or a man.

Henry Penton, whose resignation as superintendent of the engine department of the Chicago Ship Building Co. was announced recently, goes to Fraser & Chalmers as superintendent of their works when the steamer Cornell, now nearing completion at Chicago, is turned over to the Pittsburg Steamship Co., about the middle of next month. The Fraser & Chalmers plant is a very large one, next to the Allis works. In noting Mr. Penton's retirement from marine engineering, it may be said that he has certainly had a wide experience and is probably as well known as any engineer on the lakes. Besides having worked as a machinist, he went to sea and became a chief engineer when a very young man. About 1890 he was appointed chief engineer by a company that was having a fleet of steel steamers built on the lakes for ocean service and took to the coast the first steel steamship ever built on the lakes for seagoing trade. While on the coast he was offered and accepted the position of constructing engineer with the old Frontier Iron Works of Detroit and continued with them five or six years, during which time he designed the machinery for some thirty steamers for lake and ocean service. Later he was engaged with Samuel F. Hodge & Co. of Detroit and still later took charge of the engineering department which was being organized by the Chicago Ship Building Co. The Chicago Engine Works, although not very large, is certainly one of the finest in America.

TWO MORE AMERICAN TRAMPS.

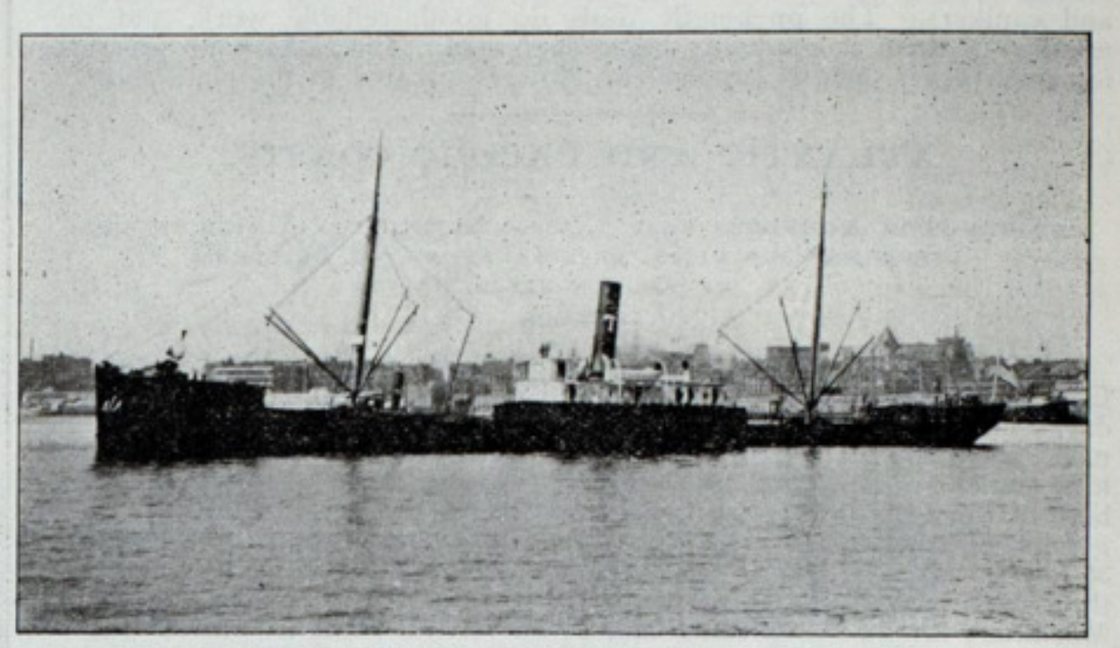
DESCRIPTION OF THE HYADES, ONE OF TWO STEAMERS FOR GENERAL CARGO PURPOSES, RECENTLY BUILT BY THE MARYLAND STEEL CO. FOR THE BOSTON TOWBOAT CO.

Among the latest additions to the American merchant fleet are two successful ships built for the Boston Towboat Co. by the Maryland Steel Co., Sparrow's Point, Md. They are of the tramp kind of seagoing vessels and are the largest of their class built and engined by an American concern. Their hulls and machinery were designed by C. W. Wiley, superintending engineer of the Boston Towboat Co., who also superintended their construction. A description of one, the Hyades, is a description of both. The dimensions of the vessel are: Length over all, 349 feet 6 inches; length between perpendiculars, 330 feet 6 inches; beam, molded, 47 feet; depth, molded at side, 28 feet; gross tonnage, 3753; net tonnage, 2900 tons. They are built of mild steel throughout and in excess of the rules of United States standard three-deck type of ship. The vessels are of great carrying capacity and moderately speedy at sea. The keel is of the flat plate type. The stem and stern frames are steel castings. The rudder is of the plate built up type, the stock being of steel and of 8¾ inches diameter; heel and pintles, 4⅜ inches diameter. The frames of the vessel are of channel section, 6 by 3½ by 3½ by 15 pounds, spaced 24 inches center to center. Frames in way of poop, bridge and forecastle are extended to form framing for the same. Double frames of angle iron are fitted at each bulkhead. There are two complete steel decks. The vessel is divided in four separate holds. A double bottom extends the entire length of the ship, which is divided into six compartments and is 3 feet 6 inches deep in the center with a capacity of 1,100 tons of water ballast. Both forward and after peaks are fitted with water ballast. The poop deck and forecastle decks are each about 50 feet long, while the bridge deck is about 80 feet long.

On top of the bridge deck is the steel deck house containing the living quarters for the officers and engineers. These quarters are finished in cypress wood with compressed cork floor and enameled iron berths. The captain's quarters are very large and commodious and consist of a sleeping room, saloon, pantry, bath and toilet rooms. From the captain's quarters a stairway leads to the chart house above. Forward of the chart house is the pilot house, in which are located of course the binnacle, steering gear and telegraph signals to the engine room. Above the pilot house is a flying bridge, and on this are fitted also telegraph signals to the engine room, and speaking tubes to pilot house, binnacle, etc.

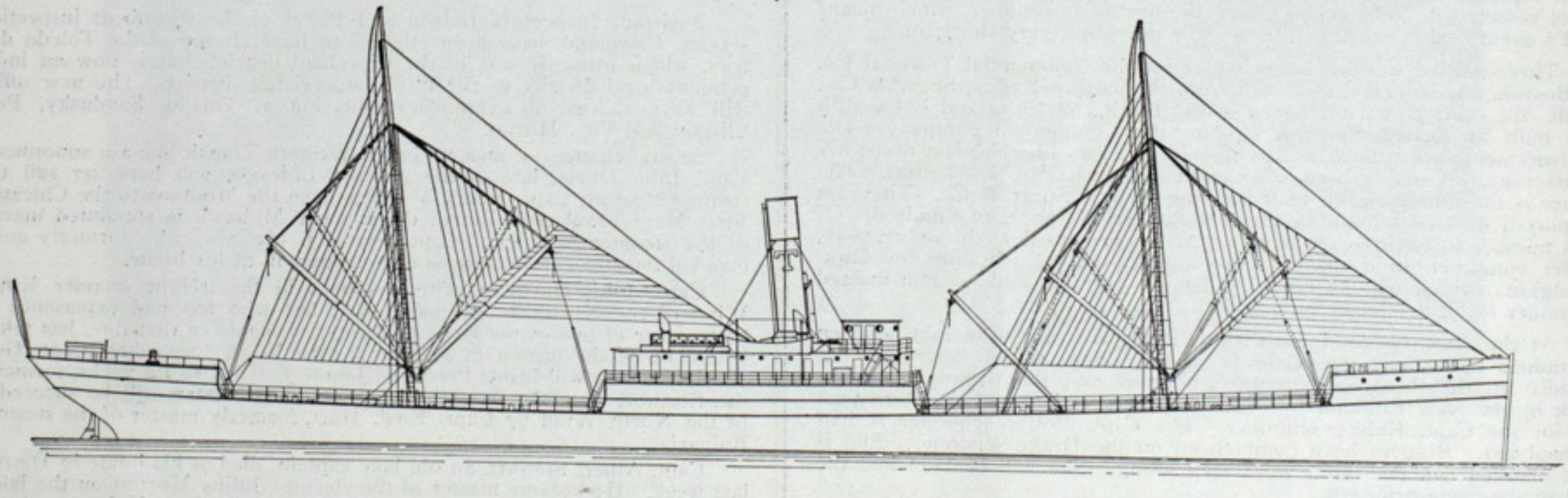
On the main deck forward between forecastle and bridge decks are three large cargo hatches; and between bridge and poop decks there are four hatches. The hatches are especially fitted for Atlantic trade. Holds and hatches, while designed for general trade, are fitted also for the rapid handling of a coal cargo. There are two steel masts, schooner rigged, with four cargo derricks fitted to each mast. All rigging is of galvanized steel wire. Four double-cylinder, double-drum Williamson hoisting engines are fitted for the rapid handling of general cargo. A steam steering engine of the Williamson type is fitted in the after end of engine room. A Robinson hand steering gear is located on the poop deck aft, as is also a Hyde steam capstan with double 7 by 8-inch cylinders. On the forecastle deck is located a powerful Hyde windlass with double 10 by 10 cylinders. Here are the ship's stockless anchors. Underneath this deck are the quarters for the sailors and firemen. Two 26-foot life boats are carried alongside of the smokestack casing and an 18-foot dingey is carried on the after end of the bridge house.

Propelling machinery consists of a triple expansion surface condensing engine, with cylinders of 21, 35 and 53 inches diameter and 42 inches stroke. At 95 revolutions per minute and 175 pounds steam pressure these engines develop 1500 horse power. The air pump and bilge pumps are attached to the main engine. The feed pump is a duplex Blake pump, admiralty type, size 8 by 5 by 12 inches. The main donkey pump is a duplex Blake, size 12 by 8½ by 10 inches, and is connected to sea, bilges and boilers, and also arranged as a circulating pump for the condenser in case of accident to the main circulator. A large ballast pump, duplex pattern, size 7½ by 10½ by 12, is connected to ballast tanks and bilges. The circulating pump is of centrifugal type, size 12 inches. The electric lighting apparatus consists of a Sturtevant plant of 10 K. W., direct connected, 7 by 7 vertical engine. The ship is fitted with a very large number of lights, special provision being made for lighting cargo holds. An 18-inch Rushmore search light is fitted on the top of the pilot house. A 15-ton evaporator of Williamson make is connected complete in engine room. The boilers are two in number, placed side by side, with back ends in engine room and a screen bulkhead fitted around them. All pipe connections, such as gauge cocks, water glasses, etc., are fitted on this end so that they are easily seen and operated from the engine room. The boilers are 14 feet in diameter and 11 feet long, built for a working pressure of 175 pounds per square inch. Each boiler has three furnaces of 45 inches inside diameter, with 300 3-inch tubes. The propeller is of the built up type, 14 feet 9 inches diameter and 13 feet 9 inches pitch. The shafting is very heavy, being 12 inches diameter at engine and 12¾ inches diameter at propeller.



THE HYADES, BUILT BY THE MARYLAND STEEL CO., SPARROW'S POINT, MD.

These ships have a carrying capacity of 270,000 cubic feet of cargo and 633 tons of bunker coal. On trial trip in ballast the Hyades showed a speed of 13 knots per hour and has since, loaded with 5,200 tons of coal and 300 tons in bunker, averaged 10 knots per hour from Newport News to Boston. The photograph shows the vessel loaded with a total of 5,500 tons dead weight.



LONGITUDINAL VIEW OF THE HYADES.

DEFENDS THE BELLEVILLE BOILER.

The eagerly expected memorandum of the British admiralty in regard to water tube boilers was issued last week. It is practically an elaborate defense of the Belleville type. It says that the trials of the Babcock & Wilcox and Niclausse types did not show any advantage over the Belleville type, but further tests were justified. The memorandum states that all nations have adopted water tube boilers in some form and have almost entirely excluded the cylindrical style. The memorandum ascribes the difficulties that have been encountered with the water tube boilers to the inexperience of the crews, engineers and stokers. The admiralty says that another advantage is the rapidity with which steam can be got up and increased. No country, the memorandum says, can afford to relinquish these advantages unless the defects which now render the machinery less reliable than the older types are likely to prove permanent. But experience shows that these defects are being rapidly overcome. The gain in speed amounts to a knot per hour.

NO TRUTH IN IT.

During the past few days the newspapers of Washington and Alexandria have been full of a story to the effect that the William R. Trigg Co., ship builders of Richmond, Va., were considering the advisability of locating at Alexandria and would do so if the town would subscribe to $1,000,000 worth of stock.

"There is absolutely nothing in the story," said Mr. W. R. Trigg. "The company has no intention of removing from Richmond. We are in receipt of many letters from Alexandria, Norfolk, Newport News and other points asking us to change location, but we have never considered the matter."

Daylight excursion to Niagara Falls via the Nickel Plate Road, Saturday, July 28, $3.00 round trip. Train leaves Pearl street, 5:30 a. m., Broadway depot, 5:35 a. m. Tickets good returning until Aug. 1, inclusive. Write, wire, 'phone or call on nearest agent, C. A. Asterlin, T. P. A., Ft. Wayne, Ind., or E. A. Akers, C. P. & T. A., Cleveland, O.
135, July 27.

LAUNCH OF THE VADERLAND.

FIRST OF SEVERAL LARGE VESSELS UNDER CONSTRUCTION FOR THE INTERNATIONAL NAVIGATION CO.—WILL BE A PART OF THE RED STAR LINE.

It was recently noted in the Review that the International Navigation Co. of Philadelphia had under construction seven new steamers—all of the twin-screw type and of 10,000 to 12,000 tons each. One of these steamers, the Vaderland, has just been launched from the works of John Brown & Co., Ltd., Clydebank, Glasgow, Scotland. This firm also has under construction the sister ship, the Zeeland. The other vessels under construction are the Philadelphia at the works of Harland & Wolff, Belfast, Ireland; the Haverford and Merion at the works of John Brown & Co., Ltd., Glasgow, Scotland; and the Kroonland and Finland at Cramps, Philadelphia.

The Vaderland, just launched, is to be engaged in the Red Star line between New York and Antwerp. The vessel is a twin screw steamer with a length between perpendiculars of 560 feet, breadth 60 feet, depth 42 feet, and a gross tonnage of about 12,000. In all departments of construction this vessel is fully up to, and in many cases exceeds, the requirements of Lloyds and the British board of trade, as well as those of the American law. There are eleven water-tight bulkheads so arranged that flotation may be maintained with any two compartments filled with water. Special attention has been given to the construction of these bulkheads, which are stiffened in accordance with the requirements of the bulkhead committee of the board of trade. If the vessels should be needed for service in time of war the disposition of the bunkers would give coal protection to the boilers, while safety from breakdowns is assured by the adoption of twin screws, which are fitted with enclosed shaftings and brought close together by the adoption of a small aperture in the stern frame. Below the main deck the hold and 'tween decks of the vessel are devoted to the carriage of cargo and stores, with the exception of a space amidships comfortably fitted for the firemen, and of a small space aft, occupied by stewards. There is cubic capacity sufficient for some 11,000 tons of cargo, and tanks are provided for more than 200 tons of fresh water, in addition to what may be condensed en route. The storerooms are spacious and well arranged for the large quantities of provisions that will be carried, and include refrigerated chambers for meat and other perishable articles.

The main deck is given up to passenger accommodation. At the forward end are three compartments for third-class passengers—the men's quarters—and at the after part of this deck are the compartments for the women and married third-class passengers, who are berthed in staterooms containing two, four or six berths. These quarters have well-lighted dining rooms. Every compartment has a wide companion-way leading to the houses on the upper deck, which contain the lavatory and sanitary accommodation, and which give access to the promenades on that deck. On this deck, amidships, are staterooms for 106 first-class passengers. On this deck also is the first-class dining saloon, which is situated between the funnels and extends the full breadth of the vessel. It can seat 208 passengers. The furniture is mahogany, except the sideboards, which are of satinwood, beautifully inlaid with various woods. For lighting and ventilation, in addition to the large and numerous side lights there is an unusually large trunk-well extending through two tiers of decks and tastefully decorated in white, and a richly ornamented glass roof. The seats are covered with moquette, and the upholstery throughout is in excellent keeping with the color scheme of the other decorative materials. Aft of this saloon, and between it and the second-class dining saloon, are situated the galleys, sculleries and pantries, so arranged that ready service can be given to either class of passenger, and fitted with all the best and latest appliances, most of which are of American make. The second-class dining saloon comes next and also extends the full width of the ship. It can seat 120 passengers and is panelled with tapestry upon a soft cream white ground. The furniture is in mahogany, and carpets, cushions and curtains are in varying shades of one color, giving a very pleasing effect. There are staterooms for 76 second-class passengers aft of this saloon.

Coming now to the upper deck and starting forward, there is a long forecastle fitted up for the accommodation of crew and petty officers, with hospitals and lavatories for steerage passengers. Amidships is a bridge house, some 220 feet long, with staterooms for 204 first-class passengers at the fore end, and 120 second-class at the after end. These staterooms are large and excellently lighted and ventilated. In a deck house aft is the social room for third-class passengers.

On the deck above is the promenade, which is sheltered by the permanent roof formed by the boat deck. On this promenade deck are situated the first-class library and smoking room as well as suites and special cabins. These rooms are in deck houses lighted by Mullin's patent rectangular windows with ventilating stained glass panels in the upper part. The library is of large size, 36 feet wide, and is painted in white enamel with panels of striped silk and silk upholstery. The windows are fitted with cloisonne glass panels which give a fine effect either by day or night. There is a beautifully designed bookcase in inlaid satinwood, a piano and convenient writing tables.

The entrance hall strikes one at once with its spaciousness and the beauty of the rich carving of the doorways. These and the staircase and panelling are in oak. Comfortable leather couches line the walls and the windows have leaded glass panels. A massive gilt grille gives a grand effect to the skylight over the staircase. Aft of the entrance hall are cabins for thirty-two first-class passengers and also four special suites of cabins each consisting of two rooms, with a lobby between, which communicates with the bathroom. These rooms are so arranged that they can be used either as sitting rooms or bedrooms as desired, and are fitted with small folding tables and other conveniences as well as extension beds. All these rooms open into passages which are continued aft so as to lead under cover to the smoking room, which is situated just aft of the engine casings. The barber's shop, bath and lavatory accommodation for gentlemen are conveniently located on this deck and with a separate stairway to the deck below. The smoking room panelling is in fumed American oak. The windows and skylight are enriched with leaded antique glass. The seats and cushions are covered with leather, and the floor with rubber tiling, which gives an excellent and comfortable foothold. A well fitted bar is arranged to serve direct into this room, and tables for card parties with all the usual smokers' conveniences are in evidence.

At the after end of the promenade deck, which is reserved for second-class passengers, is a deck house containing the entrance hall and the ladies' room, the latter being in mahogany with panels of tulipwood and satinwood with a brightly painted ceiling. The second-class smoking room is on a detached part of the promenade reached by gangways. It is much larger than is usual and has rich warm mahogany walls, leather covered seats, and leaded glass panels to side and overhead windows. The decorative scheme throughout the ship reflects great credit upon it and upon the builders. It should be mentioned that the decoration of the first-class dining saloon, drawing room and smoking room was entrusted to Messrs. Waring of London, the well known furnishers, and the sanitary accommodation for all classes of passengers is well arranged and distributed rather than concentrated. There can be carried altogether, 342 first-class, 194 second-class, and about 1,000 third-class passengers. The navigation officers' cabins are placed above the promenade deck and at the fore-end of the boat deck; and above their deck house is the spacious bridge, giving a clear view over the whole vessel and well sheltered by a strong steel bulwark. Part of the boat deck is apportioned as a promenade for the firemen and is fitted with sheltered seats—a wise and thoughtful provision for their comfort. There are altogether twenty boats, including four patent collapsible ones. The lifeboats are all of steel and are carried in the usual manner under davits. They are, of course, fitted with patent disengaging gear. The arrangements for loading and discharging cargo are very complete. There are nine hatches, each having its own winch and derrick with the necessary fittings to ensure rapid handling. The upper deck hatches are fitted with dished steel covers instead of the usual wooden ones, and should be impossible to damage, even in the unlikely event of a heavy sea coming aboard. The winches, windlasses and warping capstans are of American make. Docking and steering telegraph of Chadburn's make have been fitted and the steam steering gear is by Brown Bros. of Edinburgh and is controlled by telemotor from the wheel house on the navigation bridge. The ship is lighted throughout by electricity, the installation being fitted by the builders, as is also a complete system of electric bells. The generating plant is situated in a large room, convenient of access from the engine room, and consists of four dynamos driven by engines by the Sturtevant Co. of Boston, whose system of artificial ventilation has also been fitted in addition to the usual cowl ventilators above deck.

The main propelling engines are of quadruple expansion type, direct acting and surface condensing. The four cylinders each work a separate crank, and they are so arranged as to produce a minimum of vibration, the parts being so disposed as to be practically balanced without the use of counter weights on crank arms. The order of the cylinders from the forward end is: High pressure, second intermediate pressure, first intermediate pressure and low pressure. The sequence of turning is high pressure, low pressure, second intermediate and first intermediate. The cranks are at right angles to each other. The diameters of cylinders are as follows: High pressure, 31 inches; first intermediate, 44 inches; second intermediate, 62 inches and low pressure 88 inches, with a stroke of 4 feet 6 inches. The high pressure and the two intermediate pressure cylinders are each fitted with piston valves, and the low pressure has two treble-ported flat valves. All the valves are worked by a radial valve gear operated by a single eccentric through a quadrant rocking on trunnions. The reversing is obtained by moving the sliding block attached to the valve spindle from one end of this quadrant to the other. The lap and lead are obtained by a separate lever worked from the cross-head of the main engine. This arrangement of valve motion allows of the valves of the engine being placed at the back, thereby bringing the centers of the cylinders much closer together, and economizing space in the engine compartment, and, of course, adding to the cargo capacity in the ship. The total length of the engines is about 29 feet, which is much less than could be obtained if the ordinary link gear had been used. The reversing gear is controlled by a steam direct-acting engine.

The shafting is of Siemens-Martin steel. The four cranks are each built up separately, and are interchangeable. The crank shaft is 17¼ inches in diameter, the thrust shaft 17¼ inches and the tunnel shaft 16½ inches. The thrust blocks are of the ordinary horseshoe type, of white metal, and there are eight rings. The blades of the propeller are of manganese bronze, while the boss is of cast steel. The condensers are oblong and support the backs of the cylinders. They are of cast iron, and are fitted with brass tubes, the cooling surface being about 7,000 square feet for each condenser. The condensing water to each condenser is circulated by a large centrifugal pump driven by an independent engine, the connections being made between the two condensers. The air pumps are driven by a lever working from the crosshead of the second I. P. engine in the usual way. There are also fitted two large evaporators to produce the necessary fresh water from the sea water to make up the feed, and to avoid the use of salt water in the boilers. Two large feed heaters and filtering arrangements are provided. An auxiliary condenser has in addition been fitted on board with a separate circulating pump so that all the auxiliary machinery in the ship is worked separately from the propelling engines. An installation of Worthington pumps has been fitted on board. There are eight single-ended boilers in the ship, constructed of steel and adapted for a working pressure of 200 pounds per square inch. There are four furnaces to each boiler, making thirty-two in all, these being Brown's suspension type. The boilers are fitted with "Serve" tubes 3¼ inches in external diameter. Ellis & Eaves' system of induced draft is fitted to the boilers. The boilers are in two compartments, leading into two funnels, which are 98 feet high from the grate level, and elliptical in plan, 13 feet 6 inches by 8 feet 6 inches. The fans are eight in number and 7 feet 6 inches in diameter, and are driven direct by Sturtevant direct-acting engines. These fans, situated directly under the funnels, induce a draft through the furnaces, the air having previously been heated by passing through tubes placed in the way of the waste gases from the furnaces. The inlet of air to the furnaces is through tubes placed in a casing over the boiler, thence down a passage in front of the smoke-box at the end of the boilers and into the furnaces. The gases from the furnaces, after passing through the boiler, play around the tubes forming the air inlet and subsequently pass through the fans into the funnels.

The construction has been begun at Tampico of what will be one of the largest steel wharves in the world.

MARINE REVIEW

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Everything, excepting possibly minor details of entertainment, is now arranged for the trip of the committee of rivers and harbors of the house of representatives and commerce committee of the senate along the great lakes. The trip will be most thorough. Every port of importance will be visited and most closely inspected. The trip cannot fail but have a lasting influence upon every one who takes it. It is notorious that the average member of congress has no comprehension whatever of the magnitude of lake commerce. Nor can any mere reading of statistics give him an understanding. It is one of the things which must be seen to be appreciated. Tell him that 350,000,000 bushels of grain were moved in a season and he will say "Oh, yes, indeed," but he does not understand what 350,000,000 bushels mean. He must see the ships, elevators, the bustle of great floating property. He must be brought to understand that 350,000,000 bushels would fill a hole 40 feet wide, 30 feet deep and 175 miles long—a hole reaching from Cleveland to Buffalo. Tell him that 20,000,000 gross tons of ore will be brought down the lakes during the present season and the figures give him no adequate picture. He must see the great carriers themselves, must see the ore piles, must see the ore shipping docks with their scores of pockets, each pocket holding 250 tons, must see the vessels loaded from these pockets by means of shutes in a couple of hours, and then he will begin to understand. He must know that one vessel in a single trip carries enough ore to load a railway train several miles long. When these object lessons are presented to him he will begin to get an idea of the magnitude of lake commerce. Then he will have some grasp of the responsibility which rests upon him personally when he sees that the vessels moving this great volume of freight must follow a thin thread of a channel, not daring in some places to deviate even a few feet from the course, when they have to shift their tack a dozen times in a dangerous current. He will be more inclined to listen when range lights are asked for and when an appropriation for deepening or widening a passageway is submitted to him. The navigation of the lakes when vessels drew only 10 feet of water was a comparatively simple matter; today when they draw from 18 to 19 feet it is very much of a hazard.

The tendency in warship construction, as illustrated by the latest program of the United States navy, is a compromise between battleships and cruisers. There is little indeed to distinguish the battleship from the armored cruiser. Both aim at a maximum of offense and defense, with great speed and cruising area, the cruiser having a little less of the first two and a little more of the latter two. At any rate there seems to be a practical abandonment of that class of warship known as the commerce destroyer, a lightly-armored ship of enormous speed. The United States built two of them—the Minneapolis and the Columbia. At the time they startled the world with their terrific bursts of speed, the Columbia averaging 22.8 knots per hour and the Minneapolis 23.07 knots. Their armament was inconsiderable and their armor practically none at all, consisting merely of an armored deck. Other nations followed in the wake, the French building several, of which the latest is the Chateaurenault, which has attained a speed of nearly 25 knots per hour. Russia is now building four of them—the Askold, Variag, Bogatyr and Boyarin. England never took to this class of warship and the United States is not likely to build more of this type. Their excessive speed can be maintained only under the most favorable conditions. Some part of the organism which produces it may give out at any moment and an 18-knot boat of formidable armor and armament is likely to overtake the so-called commercial destroyer. The result of the conflict then could not possibly be in doubt.

The Deutschland has the present distinction of being the fastest liner afloat, having made the run from Plymouth to Sandy Hook in 5 days, 15 hours and 43 minutes, logging an average of 22.42 knots per hour. The only other vessel which approaches this is the Kaiser Wilhelm der Grosse of the rival German line. It is confidently expected that the Deutschland will exceed this speed as her machinery gets into better working order. Meanwhile the other ocean lines have practically abandoned the race for records to the Germans. The vessels which are being constructed by the other great transportation lines are designed more for comfort than for speed. The Cunard line has been content to rest upon the record of the Lucania from Queenstown. All of its latter vessels are designed for a maximum of passenger and cargo service rather than for speed.

Late Capt. Fred. N. La Salle.

A SKETCH OF THE LIFE OF CAPT. LA SALLE, WHO WAS PROMINENT IN SHIPPING CIRCLES ON THE LAKES, WILL BE FOUND IN THE LAST ISSUE OF THE REVIEW.

FASTEST OCEAN LINER AFLOAT.

Maiden Records.	D.	H.	M.	Average.
Deutschland from Plymouth	5	16	15	22.42 knots.
Kaiser Wilhelm from Southampton	5	22	35	21.39 knots.
Kaiser's Best.				
From Cherbourg, west	5	17	27	22.33 knots.
To Plymouth, east	5	15	10	22.63 knots.

The new marvel of the Hamburg-American line, the twin screw Deutschland, delighted her constructors and her owners by finishing her maiden trip from Plymouth to Sandy Hook in better time than any other merchant flyer has made on a westward trip. The Kaiser Wilhelm der Grosse of the North German Lloyd line has heretofore held all the records. Her maiden time over a course of 3,050 knots from Southampton three years ago was 5 days, 22 hours and 35 minutes, and her average speed was 21.39 knots. The first performance of the Deutschland, measured by the hourly average, was one knot and three one-hundredths of a knot better than that of the great Kaiser. The Deutschland covered 3,044 knots at an average speed of 22.42 knots. Her daily runs were 308, 557, 553, 551, 532 and 543 knots. She passed out of Plymouth at 10:51 p. m. on Friday, July 6, and was abeam of the Sandy Hook lightship at 10:15 o'clock Thursday morning. She had a pleasant voyage. On Monday and Tuesday she encountered fog and slowed down at times to about three-quarters speed. The exact time of her trip, allowing 4 hours and 51 minutes for the difference in time between New York and Plymouth, is 5 days, 16 hours and 15 minutes. She consumed about 500 tons of coal a day, and her machinery worked smoothly.

Her commander, Capt. Adolph Albers, says he did not at any time try to run her at top speed. He was content to break the maiden record and grab other laurels when the ship "finds herself," that is, when Chief Engineer A. Bliedung and his assistants get used to her mighty 35,000 horse power quadruple expansion engines, and her stokers become familiar with the peculiarities of her furnaces. There was an engineer of the Vulcan company aboard the ship, who helped Chief Bliedung to get acquainted with her engines. The Vulcan folks definitely promised the Hamburg line that the Deutschland will eventually average for the voyage at least 23 knots. The impression of her commander and her chief engineer is that she will do better than that. They think that when her machinery is limbered up she will be sighted off Fire island nearly half a day earlier than she was this time. If she makes an average of 23 knots an hour for the voyage she will cover the Plymouth course in five days and a little more than twelve hours.

Externally the Deutschland resembles the Kaiser Wilhelm der Grosse. She is constructed much on the same lines and has four big funnels. She is 686½ feet long—longer than the Kaiser by 38 feet—and has about 7,000 more horse power. She is inferior in tonnage and length only to the leviathan of the White Star line, the Oceanic, which was not built as a flyer. Her engines are twice as powerful as those of the Fuerst Bismarck, heretofore the crack ship of the Hamburg-American fleet. She is equipped with twin screws of manganese bronze 23 feet in diameter. Her engines are supplied with steam from twelve double-end and four single-end boilers, under which there are 112 fires. She has six decks constructed of steel and teak. Her hull is divided into seventeen water-tight compartments by transverse and longitudinal bulkheads and she has a double bottom subdivided into twenty-four chambers. She has accommodations for 467 first-class passengers, 300 second cabin passengers and 300 steerage passengers. For the first cabin passengers she has a large playroom and gymnasium on the promenade deck and a grill room on the boat deck open until midnight. She has bilge keels to prevent the squeamish from losing their interest in the voyage. The total length of the promenade deck exceeds 520 feet.

Records are best measured by hourly averages. The Deutschland has not beaten the best hourly average of the Kaiser, which is 22.63 knots, but which was made on an eastward trip. She has made the best time from the east. The best record of the Kaiser from Sandy Hook to Plymouth is 5 days 15 hours and 10 minutes—average speed 22.63 knots. The highest day's run of the Kaiser was 580 knots. The best day's performance of the Deutschland is 557 knots.

WARSHIPS BUILDING IN ENGLAND.

A SUMMARY OF WHAT THE SHIP BUILDERS ARE DOING FOR THE BRITISH GOVERNMENT—VESSELS BUILDING ALSO ON FOREIGN ACCOUNT.

From the Engineer, London.

In view of the shortly expected distribution of the work embraced in the first lord's new naval program among the royal dockyards and private ship building and engineering establishments, and the possible calls to be made upon the latter for additions to the navies of some foreign powers, the following notes of progress in such work now in hand in English ship yards and marine engine factories will be of interest to those of our readers who take note of the development and increase of navies. So far, however, as the progress made in warships building in our own royal dock yards is concerned, we have little or nothing to record, seeing that our admiralty authorities still cherish the absurd impression that it is wise policy to keep not only the press, but the interested general public without knowledge of what is being done in this direction in these establishments. From means within reach we are, however, able to record in connection with our government dock yards that there are in hand in them the following new constructions:

At Portsmouth and Pembroke respectively there are building the new armored cruisers Kent and Essex, vessels of 9,800 tons displacement, and 22,000 indicated horse power engines; and in addition at the last-named dock yard a vessel of the same class, the Drake; but of 14,100 tons displacement and 30,000 indicated horse power engines. Devonport and Chatham have each in hand a battleship of 14,000 tons displacement and 18,000 horse power engines, to be named respectively the Montagu and Albemarle, while Sheerness has nothing larger in progress than two war sloops, the Fantome and Espiégle, vessels of 1,070 tons displacement and 1,400 horse power engines. The dock yard vessels now completing are the battleships Formidable and London at Portsmouth; the Implacable and Bulwark at Devonport; and the Irresistible and Venerable at Chatham. Sheerness is completing the Vestal and Shearwater sloops. Of the actual state of forwardness of any of the above-named vessels we are, with the public, as we have said, kept purposely uninformed by admiralty authority.

Turning now to the work in hand by our private warship builders and marine engineers in England—Scotland not being within the purview of our article—we have pleasure in being able to give our interested readers a brief record of the progress made in such work at the present time. Commencing with the east coast ship yards and coming south, we first note that Sir W. G. Armstrong, Whitworth & Co. of Elswick-on-Tyne have completed and handed over the United States twin screw cruiser Albany, a vessel of 3,440 tons displacement, fitted with triple expansion engines of 7,500 indicated horse power, which attained on trial a speed of 19.6 knots with natural, and 20.5 knots with forced draft to her boilers. The preliminary trials have also taken place of the two torpedo boat destroyers built by the firm and engined respectively by the Wallsend Slipway Co. and the Parsons Marine Turbine Motor Co., but the final official trials of these vessels have not yet taken place. The Japanese battleship Hatsuse and the Japanese armored cruiser Idzumo, both built by the Elswick firm, are now nearly ready for trial; and the Iwate, sister ship to the latter, is getting well advanced. The Norwegian armor-clad coast defence ship Norge, built by the same firm, is now receiving her machinery at Messrs. Hawthorn, Leslie & Co.'s yard at Hepburn, and her sister ship, the Eidsvold, was launched a few weeks ago. Both of these vessels are of 3,850 tons displacement, 290 feet long, and 50 feet beam, and have a draught of 16 feet 6 inches. Their propelling engines—of the triple expansion type—are of 4,500 indicated horse power, driving twin screws, and are to give the vessels when running at full power a speed of 16½ knots, steam for them being supplied by Yarrow water tube boilers.

The next firm to be noted is Hawthorn, Leslie & Co. of St. Peter's works and Hepburn-on-Tyne. The torpedo boat destroyer Havock has been fitted by them with new water tube boilers of the Yarrow type and has completed her preliminary trials. The Viper, destroyer, driven by turbine engines, has also completed her trials, and is ready to leave for Portsmouth. The firm has also in hand the 30-knot destroyers Greyhound, Racehorse and Roebuck; the engines of 6,000 indicated horse power, and Yarrow boilers for the first of which—to be launched in July—are ready for the vessel; and those for the others, of the same power, are well in hand, and will follow closely after the Greyhound.

The engines and boilers for the battleship Bulwark, built at Devonport, are now in place on board, and the work in connection with the pipes, valves, etc., is well in hand, and the vessel will be ready for her steam trials about the end of the current year. Those for the armored cruiser Kent, building at Portsmouth, of 22,000 indicated horse power, are in the early stages of construction in the foundries, pattern, and smiths' shops; the boilers, which are to be of the Belleville type, being in the initial stages of progress. The propelling machinery of the Norwegian coast defense ships, Norge and Eidsvold, built at Elswick, is completed, that for the first mentioned having been fitted on board at Hepburn, and is nearly ready for trial, and for the Eidsvold, just launched, ready to be put into place.

At the ship yard and works of Palmer & Co. at Jarrow, the first-class battleship Russell, one of four similar vessels that have a displacement of 14,000 tons, and engines of 18,000 indicated horse power, is making good progress, both in hull and machinery; the former being plated and completely riveted up to the armor shelf. It is expected that the ship will be put into the water in the coming October. The machinery for the Russell —supplied by her builders—consisting of two complete independent sets of four cylinder triple expansion engines, with twenty-four boilers of the latest improved Belleville type, are making good progress in the shops, the whole of the work being well advanced. In addition to the Russell battleship, Palmer's company has also in hand for the British government three 30-knot destroyers. The Myrmidon, the second of the three ordered, is already launched, and has her engines and boilers in place. The Kangaroo is also well advanced in building, her launch being expected to take place about the end of July. The Syren, a sister vessel, is not quite so far advanced as the Kangaroo. The propelling machinery of these 30-knot destroyers, which are of 320 tons displacement and 6,000 indicated horse power, supplied with steam by the Reed type of water tube boilers, has all been made by Palmer's company, and it has every promise of being as uniformly successful as in similar destroyers built at the Jarrow works.

At Earle's Ship Building & Engineering Co.'s works at Hull, although the temporary financial difficulties of the company have affected the naval work in hand, progress has been made with the fitting on board of the engines and boilers of the first-class battleship Formidable, now completing at Portsmouth. The first set of the engines of similar size, being made by the firm for the sister ship London—also completing at Portsmouth—is delivered, and the second set of engines is being erected and will shortly be sent to the ship. The engines of both ships, which are of 15,000 horse power, are to be supplied with steam by Belleville boilers. After a highly satisfactory trial at Hull, in which a speed of 30½ knots was attained by the destroyer Dove, built at Earle's works, the vessel was delivered at Portsmouth, and will shortly proceed on her official trials in the Solent. The destroyer Hasty, originally fitted with locomotive boilers, has been re-boilered by Earle's firm with water tube boilers of the Yarrow type; her completion is well advanced, and she is shortly expected to run her trial trip. It is hoped that trials of torpedo boats Nos. 54 and 87, constructing at Earle's will closely follow those of the Dove.

From Hull there is nothing to note in warship building progress, until reaching the Thames, where we find at the Thames Iron Works Co.'s ship yard at Blackwall that the battleships Duncan and Cornwallis, building for the British government, are making fair progress, 3,000 tons of steel material having been built into the hull of the former and 2,800 tons into that of the latter. Parts of the propelling machinery to be supplied under contract for her majesty's battleship Albemarle—now building at Chatham—are also in hand at the Greenwich works of the Thames Iron Works Co. The battleship Albion, built at the company's ship yard at Blackwall, is, so far as the shipwork is concerned, practically finished. She will be delivered at Chatham dockyard during the present month.

Yarrow & Co. of Poplar have in hand several torpedo boats for the Japanese and Dutch governments. Some of the larger—or first-class—which are 152 feet 6 inches long, by 15 feet 3 inches beam, and 2,000 indicated horse power, with a speed of from 25 to 26 knots, have been already shipped to Japan, and those for Holland of the same size will be ready for trial by the autumn. Two smaller torpedo boats for the Dutch. which are 130 feet long, 13 feet 6 inches beam, 1,300 horse power, and 24 knots speed, are practically finished. The Dutch boats will be tried on the Thames; and all the Japanese boats will be sent out packed in pieces for re-erection in Japan. The armament of all the larger boats consists of three torpedo tubes and about five quick-firing guns. The smaller boats are armed with three torpedo tubes and two or three quick firing guns.

At the works of Humphrys, Tennant & Co. at Deptford Pier, the machinery for the first-class armored cruiser Drake of 14,100 tons displacement, building at Pembroke, is being rapidly proceeded with; the erection of the main engines, which are of 30,000 indicated horse power—the first of this size ordered by the British government—has already been commenced in the shops, and the first delivery of the boilers, which are of the Belleville type, will be made shortly. There is also rapidly approaching completion at the Deptford Pier works the machinery for a first-class battleship and two first-class cruisers for the Japanese navy.

The British first-class cruiser Spartiate, built at Pembroke, and engined by the late firm of Maudslay, Sons & Field, is now preparing for her trials at Portsmouth, and the machinery constructed by the same firm for the battleships Irresistible and Vulnerable is being fixed on board in Chatham dock yard.

At the Chiswick ship yard, J. I. Thornycroft & Co. are just completing the two destroyers, the Albatross and Stag, built for the British government. The first named, which is 227 feet long, 21 feet 3 inches beam, and 8 feet 5 inches draught, attained on the first run she made a speed of 32¼ knots. The Stag, 210 feet in length, 19 feet 6 inches beam, and 7 feet draught, made on her official trial—a run of three hours' duration—a speed of 30.156 knots. The torpedo and machine-gun armament of both vessels consists of five 6-pounder and one 12-pounder quick-firing guns; and the torpedo gear is two revolving tubes on deck, arranged to discharge 18-inch Whitehead torpedoes. There are also just completing at the Chiswick yard, for the French government two shallow draught gunboats, the Argus and Vigilante, each being 145 feet long, 24 feet beam and 2 feet water draught when loaded, which attained on their official trials on the Thames an average of 13½ knots. Two lighters will accompany these vessels, the whole being built in flotable sections to facilitate transport, and intended for service in China. In addition to the boats above mentioned, J. I. Thornycroft & Co. have in hand four first-class torpedo boats for the British navy, which are larger and more powerful than any we now have, or are in the possession of any foreign navy, so far as is known, but the particulars of which are at present unavailable.

Of the west coast warship-building firms, Laird Brothers at Birkenhead have now completed the first-class battleship Glory, built and engined by them for the British government. This vessel has completed her official trials, at which she attained the following results: On the first thirty hours' trial, a speed of 10.4 knots an hour was maintained with a developed engine power of 2,879 horses;on the second thirty hours' trial, 16.78 knots were made with 10,587 indicated horse power; and on the full power trial a speed of 18.12 knots was maintained with 13,747 indicated horse power. The vessel is now being prepared for her gun trials, which will shortly be carried out. Good progress has been made at Laird's works with the construction of the first-class battleship Exmouth, nearly 2,500 tons of material having been worked into the hull. Her machinery and boilers are also well in hand. The single screw sloops Mutine and Rinaldo have both been launched, and are having their machinery fitted on board, and completed as rapidly as possible for trial. The engines for the battleship Implacable of 15,000 horse power have been shipped to Devonport, and their erection on board the ship is approaching completion. The 30-knot destroyers Lively and Sprightly, building by Laird Brothers, are ready for launching, and their machinery is in an advanced stage. The machinery, of 18,000 horse power, constructing by the same firm for the battleship Montagu, building at Devonport, is now well in hand. An order for a set of water tube boilers of the Laird type for the Blonde, similar to those lately supplied by Laird's firm to the sister ship Blanche, has recently been received from the admiralty, and the work is being proceeded with. The 30-knot Russian torpedo boat destroyer Söm, built by this firm, is ready for sea.

EXPORT OF AMERICAN COAL.

The coal situation in Europe, which is evidently one of no little anxiety to the industrial statisticians, is made the basis of somewhat extravagent predictions on the part of dealers in this country of a great, immediate and rapidly increasing exportation of American coal. That our output, especially of bituminous coal, could be increased, will be admitted; but between the pit mouth and the foreign consumer there is literally "a great gulf fixed," which cannot be bridged or spanned quickly enough to meet any present or immediately prospective exigency of the foreign coal markets, so that any sudden and wonderful expansion of the coal exports of the United States may be regarded as improbable, if not impossible.

Probably the least difficult element of the problem of a great coal export from the United States is to mine the coal, but the preparations for this will consume a good deal of time and involve heavy investments of capital. The capital can be had easily enough, if it can be shown that the business is a permanent one and likely to pay a satisfactory profit. This might be difficult. The present scarcity and high price of coal in Europe is due chiefly to temporary causes. The restoration of peace in Africa and China and a relaxation of the present tension of industrial activity, especially in the iron and steel trades, would probably relieve any anxiety as to the coal supply of Europe and make our ability to market considerable quantities of coal dependent upon the price at which it was offered. There is also enough uncertainty as to the peace of Europe to make the conservative capitalist discreet in the matter of investments to supply the European coal demand. Coal is in the highest degree contraband of war, and should the threatened partition of China set the great powers quarreling, and give France, in alliance with Russia, a chance to move against England and Germany, the transoceanic coal trade would be very seriously interrupted.

But with such a mining development as those who are anxious to handle coal for export are urging, the question of getting the coal to the seaboard remains to be answered. It is now difficult to procure cars enough for the present demands of coal transportation. They could, of course, be built, but the money needed to provide them would not be easily raised under present conditions. If, however, we had plenty of coal cars, we should have to build additional railroads to tidewater. The capacity of the roads leading to the Atlantic ports suitable for extensive coal shipments is pretty well congested as it is, and those which could materially increase their eastward movement of coal tonnage lack adequate terminal facilities and could not economically transfer any considerable quantity of coal from cars to ships. Those having such terminal facilities could not easily, quickly or cheaply increase them, and are quite sure not to consider doing so until the mileage of tracks and the supply of cars and engines needed to bring the coal to tidewater is assured. Coal docks on deep water are very expensive constructions. They will not be built until a constant and profitable use for them is shown, and without them the amount of coal exported will depend upon the amount which can be spared from the quantity that now reaches tidewater. If, however, new sources of supply were developed, the cars and engines built, the additional tracks and necessary sidings laid, and the terminal facilities provided, where shall we find the fleet of ships to carry abroad as much coal as the statistical estimates show is needed to meet the European deficiency? They are not afloat at the present time. The business of carrying coal could be made profitable to tramp steamers and other casual vessels only on the assurance of return cargoes, and there is not enough merchandise to be brought back to warrant vessel owners in engaging extensively in this business. Coal would not bear a rate of ocean freight high enough to make it pay to return the vessels in ballast. To meet this difficulty the dealers who are scheming for an extensive export trade in coal are agitating for the admission of foreign built ships to American registry, but it is not clear how this would help the matter any. There is not at present much tonnage suitable for coal carriage which could be picked up in Europe at low prices; and if such vessels cost nothing, it is doubtful if it would pay to run them empty one way to carry coal the other way. Coal is not yet dear enough in Europe to warrant this, and will not probably be dear enough for the next quarter of a century to make its carriage profitable to vessels which cannot anywhere secure return cargoes. What shall be imported to furnish such cargoes?

There is reason to believe that within the next few years a considerable and sustained increase will take place in the coal exports of the United States, but it cannot be immediate, nor is it likely for some time to figure prominently in our international trade balance. From many points of view this is fortunate. Coal is not like wheat or corn. Great as our natural resources undoubtedly are, they are not self replenishing. We have only so much coal, at best, and the obstacles in the way of exhausting our mines to stimulate and sustain the industries of other nations are happily a check upon present enterprise to the disadvantage of future generations. We have no more coal than we shall need, sooner or later, and there is no reason to regret that the way is not open for a great coal export at low prices. Exports of manufactures pay better,, and will do vastly more to build up the national prosperity.—Iron Age.

WIDENING PARTS OF HAY LAKE CHANNEL.

Col. G. J. Lydecker of Detroit has been spending a few days in government inspection work at Sault Ste. Marie, Mich. He says that just before leaving Detroit he received the approval of the secretary of war to the project to widen the Little Rapids section of the Hay lake channel and that tenders for doing the work will shortly be advertised for. The project calls for the widening of the channel from 300 to 600 feet at the upper end to intersect with portions at the lower end that now have a width of 600 feet, making a minimum width of 600 feet clear through to the foot of Hay lake. The entire Hay lake channel will also be deepened sufficiently to provide a depth of 20 feet at the ordinary low stage of water. At present the actual depth is from 18½ feet to 19 feet. Col. Lydecker says that probably some clearing out of the old Lake George channel will be done. The projected improvements will call for the expenditure of $250,000.

The Southern Pacific Co. has decided to establish a steamship service between New Orleans and Havana. The steamers Chalmette and Algiers have been taken from the New York service and will be put on the new line.

SHIP BUILDING THROUGHOUT THE WORLD.

Reports regarding the building and launching of ships in Great Britain during the first quarter of 1900 show a general decrease when compared with last year, due mainly to high prices prevailing in iron and steel. The gross tonnage of ships (war ships excluded) launched in Great Britain during the first three months of 1900 was 265,000 tons, of which 264,000 tons were in steamers. As for ships (war ships excluded) under construction during that period, there is also a considerable decrease noted when compared with the same quarter of 1899, but quite an increase over previous years, as the following table will show:

Year.	Steamers.	Sailing vessels.	Total.
	Tons.	Tons.	Tons.
1897	810,400	18,000	828,400
1898	1,181,000	4,000	1,185,000
1899	1,382,200	3,400	1,385,600
1900	1,249,000	11,000	1,260,000

A noted increase in the construction of large steamers is reported. Three months ago there were building only three steamers of more than 10,000 tons, while now seventeen are in course of construction. There are also building four vessels of 9,000 to 10,000 tons, two of 8,000 to 9,000 tons, and seven of 7,000 to 8,000 tons. In the construction of war ships a continued increase was noted. At the end of the month of March there were building:

Year.	For English account.		Foreign account.	Total.
	Government wharves.	Private wharves.		
	Tons.	Tons.	Tons.	Tons.
1897	133,000	121,300	810,000	335,000
1898	104,800	133,700	117,400	355,000
1899	152,800	171,800	109,000	434,000
1900	162,700	222,800	68,600	454,100

It appears that the construction for foreign account during the last three years has been decreased while the construction for Great Britain has been considerably increased, especially at private wharves, where the British government is having more ships built than at its own wharves. The larger number of men-of-war built, however, does not cover the decrease in the number of merchantmen, but falls short about 100,000 tons, or 6 per cent.

As for ship building in other countries, Germany takes the lead, but is followed closely by the United States. Merchant vessels under construction during the March quarter, 1900, are noted at Lloyd's as follows:

Country.	Steamers.	Sailing vessels.	Total.
	Tons.	Tons.	Tons.
Germany	154,000	3,000	157,000
France	45,000	60,000	106,000
Holland	24,000	6,700	30,700
Italy	101,000	4,500	105,500
Norway	24,700	.....	24,700
Sweden	3,000	300	3,300
Denmark	6,600	.....	6,600
United States	111,100	4,400	115,500

Besides these, there were building in Japan 13,000 tons for European account, which is considered phenomenal.

BETHLEHEM TOOL STEEL.

Many master mechanics in attendance at the recent convention at Saratoga were interested in a new tool steel made by the Bethlehem Steel Co., referred to in these columns some time ago, and a few samples of the work of which were exhibited by Mr. H. F. J. Porter. It is believed that they represent more rapid machine tool work than has heretofore been accomplished. The following will give an indication of the very high speed cutting:

Quality of Steel.	Width of cut.	Depth of cut.	Speed in feet per minute.
.60 carbon.	⅝ to ⅞ in.	7-32	29 ft. 6 in.
.40 "	3-16 "	1-16	60 ft.
.10 "	3-16 "	1-16	150 ft.
1.05 tool steel.	3-16 "	1-16	15 ft.

The peculiar property of this steel is that it does not soften as it gets hotter up to the red point on the cutting edge. Ordinary self-hardening steel is so called because it does not require tempering after it is forged, but as is well known, the cutting edge is soon destroyed if it is overheated while at work. While the new steel belongs to the self-hardening family, it receives an additional treatment, which gives it the peculiar and valuable quality of retaining its normal degree of hardness in spite of overheating. It is thus possible to increase the speed of cutting tool up to the high figures given above.

The great advantage of the use of this steel has been shown in a striking manner at the Bethlehem works, where they have been able to increase the output of their machine tool department four-fold by forcing and speeding the tools up to the capacity of the new tool steel. The steel is so soft that it can easily be forged to any desirable shape, and can be machined and filed when ready for use on the lathe or planer. The advantage of this remarkable discovery, to master mechanics, will depend upon the extent to which they have utilized the possibilities of the tool steel of regular grade now on the market. Machine tool builders are already recognizing the meaning of the new requirements and are arranging to build standard tools to run at greater speeds and of much greater power.—Railway Age.

CARNEGIE ORE INTERESTS.

IMPORTANT IN THE MANUFACTURE OF IRON AND STEEL AT LOW PRICES—WHAT THEY INVOLVE.

Duluth, Minn., July 18.—The Oliver Iron Mining Co., ore department of the Carnegie company, expects that its ore production this season will exceed 5,000,000 gross tons, notwithstanding the unsatisfactory condition of the iron and steel industries at present. Officials of the company say they do not believe the consumption of ore will be materially lessened, but rather that with a lower and more conservative price for finished material, there will be a greater production than ever.

"We have never desired a continuance," said an officer of the company in speaking of this matter, "of the high prices for steel. The mining company, with its mines on every one of the five Lake Superior ranges, with its steamships and other connections, and its direct rail haul to the furnaces at Pittsburg, believes it can deliver ore at as low a price as any other interest, and lower than most of them. We do not want more than a fair profit, and we think that what may be a fair profit to us will not be extraordinary to others. There will be an enormous consumption of ores with prices at a reasonable point and the slackness of trade in ores and ore lands is a matter of indifference to us.

"The Oliver Iron Mining Co. has not paid high prices for its ores in the ground, and holds vast tonnages under reasonable leases or under fee purchases that do not burden the company with excessive interest charges. We have all grades of ore, and it may be doubted if people generally realize what our resources are. While we have not yet entirely fixed out our grandchildren, we have ore enough to last a good many years and are still taking more. We have explorations on every range, especially on the Menominee and Vermillion, and less on the Mesaba. On the Menominee range we have twenty-five to thirty explorations under way, and a dozen drills in the Vermillion."

The Oliver company is employing at mines some 4,500 men and its monthly payroll is in the neighborhood of $250,000, rather more than less. It is the greatest mining company in the world, both in payroll and output, though there are foreign steel making interests that probably employ more men. On the two Minnesota ranges the company has the largest groups of opened mines; its Norrie, Aurora and Tilden on the Gogebic contain the bulk of Bessemer ore left on that range; its Lake Superior and Regent mines on the Marquette are capable of a sustained production of perhaps 1,200,000 tons a year for many years, and on the Menominee it is fast bringing into line some mines at Iron River that will rank high, while other explorations there promise good returns.

Under the Oliver contract one-sixth of the product of the Oliver company mines goes to the National Steel Co., and this proportion will be taken by that company, the rest going to Carnegie furnaces. Under the Rockefeller contract of 1896 the company is fixed with a volume of vessel capacity that amounts now to about 1,500,000 tons. The Carnegie company's ships (Pittsburg Steamship Co.) will probably not carry, including the new boats and those purchased last spring, to exceed 1,000,000 tons, but next year they will probably double that amount. If success is attained with the large unloading machines now under way at Conneaut, the unloading charge, which is a large item in the cost of carrying ore by lake, will be reduced to a minimum and the Carnegie company will have first advantage of these machines. All the savings of mining, lake transportation, handling, and rail carriage to Pittsburg inure to the benefit of the finished product and are accumulative toward the end.

This company is now engaged in sinking a number of fine mining shafts and equipping them with the best and most economically operated machinery. Two of these shafts will average 1,000 feet depth. Shallower shafts are being sunk on the Vermillion and Menominee ranges. On the latter the company is completing the great work of changing the course of Iron river, to permit the opening of the Riverton and Dober mines on a large scale, and it is making a mine at Lac Fumee, a few miles from Quinnesec, and may at some future time drain the lake. Lands are also being explored on the northern side of the international boundary in western Ontario, where there are large bodies of iron. The company is not willing to take any ores but the hematites, and much of the Canadian ore is magnetic.

THERMOMETERS FOR MECHANICAL USES.

In a bulletin of recent date, No. 40a, the Helios-Upton Co. of Peabody, Mass., describes its make of standard thermometers for mechanical uses. These thermometers are now being used by the United States navy in all new ships. They possess innumerable advantages over the ordinary thermometer. They are constructed with extensions of various lengths, with the lamina or working part of the instrument at the end of the extension farthest away from the case, so that the lamina may be put through the sheet of a boiler, the side of an oven, or the wall of a kiln, through a hole drilled for that purpose, to allow the extension to project into any liquid, or into the hot or the cold vapor contained therein, showing the temperature of the same on the dial outside. These instruments are held in place by substantial screw joints of regular pipe size thread, so that the threads may be cut through the boiler by regular taps. When the instrument is screwed into position it is a permanent part of the boiler itself and a perfectly tight joint is made around the stem of the instrument. The expansion and contraction of metal is the same for each degree throughout all ordinary ranges of temperature. This fact has been established by careful scientific research, and enables the makers to put forth thermometers that can be depended upon for accuracy throughout the entire scale for which they are adjusted. The peculiar advantages of the standard dial thermometers over the mercury column instruments are their accuracy after long continued use and the legibility of their dials.

In ordering these instruments state if they are to be used in brine, ammonia or other chemicals, and if under pressure, how much; so that they may be made of suitable metal to withstand the pressure and chemicals to which they are exposed.

M. G. Knox & Son of Marietta, O., have received from the Baltimore & Ohio Railway Co. the contract for a new wharfboat. The boat will be 216 feet long, 40 feet wide and 6 feet deep. It will be placed in service in Cincinnati.

PROTECTED CRUISER NEW ORLEANS DEFECTIVE.

Evidently the protected cruiser New Orleans, which was purchased abroad during the Spanish-American war, is not a success. She is at present at the Asiatic station where she has spent considerable time undergoing repairs. Capt. Ide complains bitterly about the ship in the following letter to the navy department:

"I beg leave to say that it was my ambition to be ready to perform any service which the commander-in-chief may think suitable for a vessel of the size of the New Orleans. It is undeniable that in certain localities about the coast of the island of Luzon, previously unknown dangers may be disclosed at any time, and that smaller vessels with less draught would run less risk, their loss would be comparatively unimportant, and fewer lives would be exposed to danger. This same reasoning, however, would apply to other large vessels, which, except in case of the Charleston, have successfully executed their orders, and I know of no reason why, with ceaseless vigilance, we could not do as well. I feel compelled, however, to refer to two reasons which make it desirable that this vessel should serve in cooler climate than that of Luzon, and in respect to the ways in which this vessel differs from an American-built war vessel. Despite every expedient the temperature of the cordite magazines ranges from 95 to 98 degrees Fahrenheit, which, according to the best obtainable information, is very near the danger point for that explosive. Having requested a board to examine into the matter, it may be that their investigation will provide a method of lowering the temperature of the magazines. In the contrary case, I can continue to exercise constant watchfulness and in case the cordite shows pronounced signs of deterioration can, through the recommendation of a board, have part, or if need be, all of it thrown overboard.

"While in ordinary vessels the number of cubic feet of air for each man ranges above 1000, in this ship, because of her peculiar construction and the fact that all available space is utilized, there are but about 200 cubic feet of air per man, with a very defective circulation. In consequence, nearly all of the crew and most of the officers are obliged to sleep on deck, their quarters being uninhabitable in this climate. This applies to all times in the prevailing temperature here, but when the sea makes it necessary to close all the air ports on the berth deck, practically the whole crew is obliged to sleep on deck. In case of rain they are forced to stand up under the housed awnings until the rain ceases. This involves much loss of sleep during the rainy season and exhausts the men. In a cooler climate most of the men could sleep below.

"Referring to the rig of the vessel, in view of her small metacentric height, as reported by Naval Constructor Bowles—about 16 feet—it would seem that her military masts and superstructure have a tendency to make her somewhat topheavy, and it would therefore be unwise to reduce her stores and coal supply too much. An effort is made to keep all weights stowed low. In the trip from Nagasaki to this point she behaved admirably, but the sea was not high enough, nor in the proper direction to test her qualities. With proper attention to her trimming tanks and to running the coal into the lower bunkers as fast as it is used, care being taken not to exhaust the supply of stores, her present rig should offer no menace to her stability. It is proper to state that my opinion is based on conversation with the officers who have served in the ship and on examination of the records. I have been on board but three weeks."

NAVAL MATTERS.

The navy department will during the present year make the largest contracts for ships in the history of a single year. The contracts will involve the construction of five of the largest battleships ever built by any government, six first-class armored cruisers, which are in themselves battleships, and three protected cruisers. The board of construction is now working on the plans for the three protected cruisers. Tentative plans have been made which contemplate ships having a displacement of not less than 8,000 tons, a speed of 23 knots and main batteries of 8 or 6-inch guns mounted in pairs. The total cost of the program will approximate $40,000,000.

At the Indian Head proving grounds on July 10 the naval ordnance bureau held a test on a Harveyized Carnegie armor plate which is of the last group of turret armor for the battleship Illinois. Two 12-inch shots were fired according to specifications. The first traveled with a velocity of 1456 feet per second and penetrated to a depth of 8¾ inches, the shell breaking up and the pieces rebounding. The second shot was fired with a velocity of 1852 feet per second. Its estimated penetration was 12 inches.

Rear Admiral Endicott, chief of the bureau of yards and docks, has directed Civil Engineer Asserson of the New York navy yard to make plans for a stone and concrete dry dock to be built there. An appropriation of $1,000,000 for this dock became available on July 1. The general plans provide for a dock between 500 and 550 feet long, with a depth of 32 feet.

The Cramps have notified the navy department that the battleship Alabama will be ready for its trial trip on August 14. The trial will take place over the regular course off Cape Ann, Mass. The Alabama will be required to maintain an average speed of 16 knots during a run of four hours.

The bureau of navigation, navy department, has recommended that the old Alliance be converted into a sailing vessel and the board of construction has indorsed the recommendation. The work will be done at the New York navy yard.

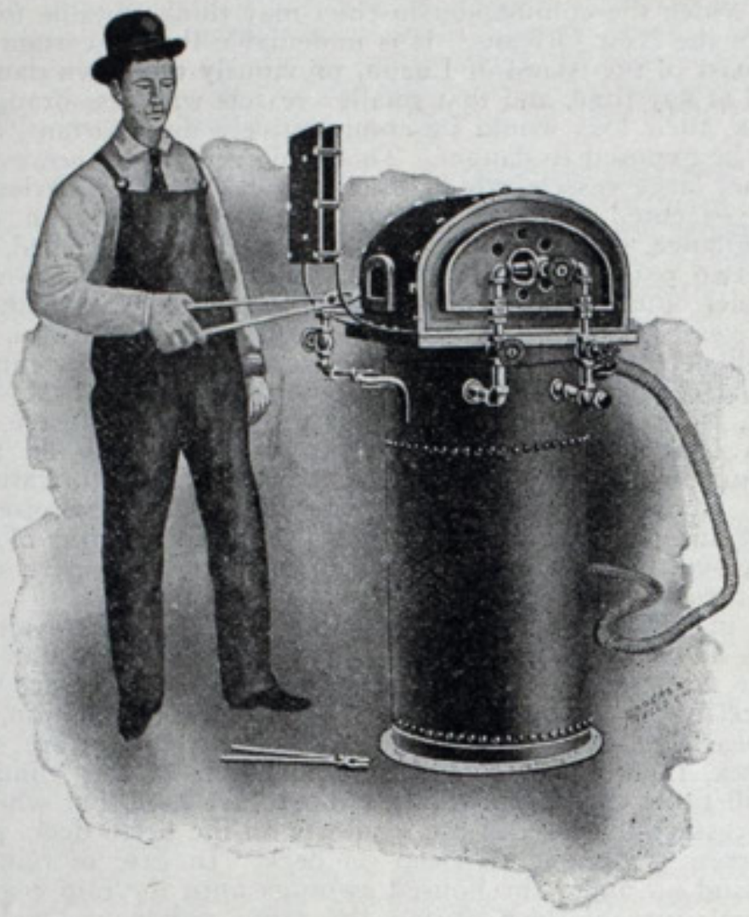
The United States training ship Hartford has been docked at the New York navy yard for a general overhauling. As soon as the work is done she will start on a European cruise.

The battleship Oregon will be put in dry dock at Kure, Japan, and it is expected that it will take three months to get her into shape.

"A MANUAL OF NAVAL ARCHITECTURE," by Sir Wm. H. White, director of naval construction in England, is one of the best-known books of its kind in the world. A fifth edition, revised and largely rewritten, is just out. It is a text book for students of naval architecture. Price $9. The Marine Review Publishing Co., Perry-Payne building, Cleveland.

PORTABLE OIL RIVET HEATING FORGE.

The accompanying illustration shows an improved oil rivet heating forge just put on the market by the Chicago Pneumatic Tool Co., Monadnock block, Chicago. The fuel may be fuel oil or kerosene, at the option of the user. The capacity of the forge is 500 rivets per hour. It is entirely under the control of the operator at all times and is absolutely



safe. In point of economy it eclipses anything heretofore introduced. This machine was shown at the convention of the American Master Mechanics' Association and Master Car Builders at Saratoga recently and elicited the highest praise from those who could judge, from a practical standpoint, of its merits. The adaptability to ship building and structural iron work of all kinds is obvious to those familiar with those lines of industry.

After a thorough practical test of pneumatic hammers, the General Electric Co. of Schenectady, N. Y., has placed its entire order for pneumatic hammers with the Chicago Pneumatic Tool Co. The Chicago company is naturally much pleased with the outcome of the test.

LAKE FREIGHTS ON HARD COAL.

In view of recent discussion relative to freights on hard coal out of Buffalo during the present season, attention is directed to the following table of rates on July 19 of each year, from 1893 to 1900 inclusive:

	TO CHICAGO.	TO DULUTH.
1893	50 cents.	30 cents.
1894	45 "	25 "
1895	50 "	25 "
1896	30 "	25 "
1897	20 "	20 "
1898	25 "	20 "
1899	60 "	40 "
1900	50 "	40 "

H. M. FLAGLER INTERESTED IN TRIGG WORKS.

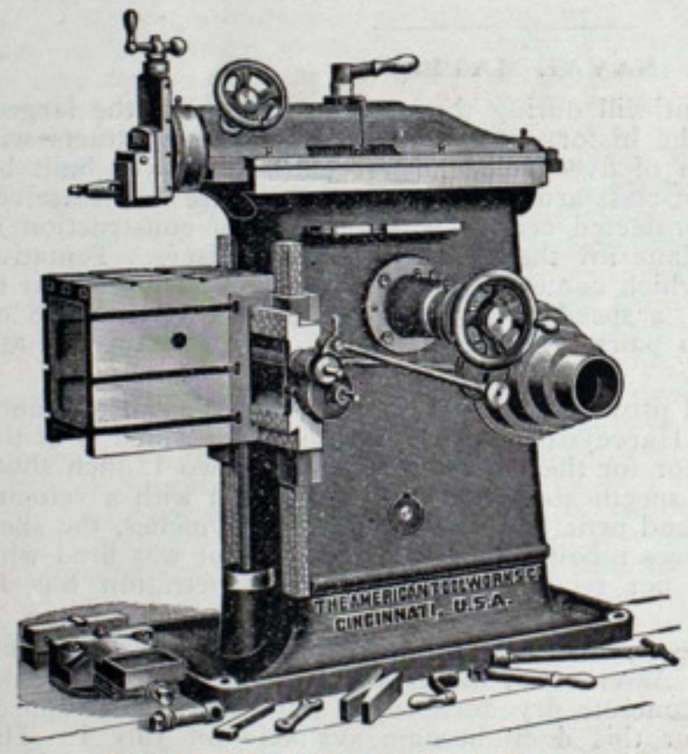
The Review is informed by telegram from Washington on what seems to be very good authority that Henry M. Flagler, capitalist, well known on account of connection with the Standard Oil Co., has subscribed to $100,000 worth of stock in the Wm. R. Trigg Co. of Richmond, Va., and that improvements in the ship building works of the Trigg company will be far more extensive than was planned some time ago.

PLANS FROM THE CRAMPS AND THE UNION IRON WORKS.

Rear Admiral Ahmed Pacha of the Turkish navy, who came to the United States about two months ago to make a contract for the construction in one of the ship yards of this country of a cruiser for the Turkish navy, has about completed his work here and will sail for home this week. He has secured plans from the Union Iron Works of San Francisco and the Cramps of Philadelphia for a protected cruiser 330 feet long, of 22 knots speed and 12,000 horse power. At his own suggestion changes have been made in the plans and specifications furnished by the ship builders from time to time, designed to meet the requirements of the Turkish naval service. The admiral is very well satisfied with the terms offered by the ship builders, and says that none better could be obtained. He will submit them to his government, and, if satisfactory to the officials, he expects that arrangements will be made for a contract with one of the firms for the construction of a vessel.

It is said that he may recommend that his government contract for a ship from each of the firms, though he has not reached a definite decision on this point. Admiral Pacha is greatly pleased with the hospitalities and kindness which have been shown him in official and private life since he has been in this country. Of the many places he has visited during his life, nowhere, he says, have these considerations been more marked than in the United States.

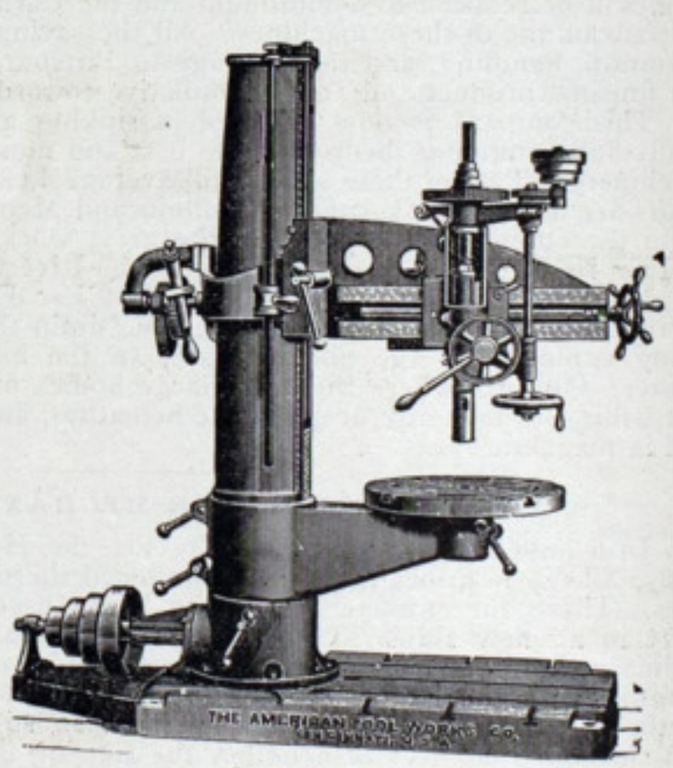
Daniel J. Keefe of Chicago was again elected president and H. C. Barter of Detroit secretary and treasurer of the International Longshoremen's Union at the annual meeting in Detroit, a few days ago.



New 16″ Back Geared Crank Shaper.

Machine Tools

LATHES, PLANERS, SHAPERS,
BORING and TURNING MILLS,
UPRIGHT and RADIAL DRILLS,
SCREW MACHINES,
PULLEY LATHES,
BOLT CUTTERS, Etc.



3′ Radial Drill.

The American Tool Works Co.,

BUILDERS OF COMPLETE LINES OF MACHINE TOOLS,

WORKS: CINCINNATI, U. S. A.

NEW YORK OFFICE: 120 Broadway, Geo. Place, Agent.
NEW ORLEANS: The Fairbanks Co.
CHICAGO STORE: 68-70 South Canal Street.
PHILADELPHIA: The Fairbanks Co.
CLEVELAND: The Strong, Carlisle & Hammond Co.
BOSTON STORE: 36 Federal Street.
BALTIMORE: The Fairbanks Co.

SAN FRANCISCO: Henshaw, Bulkley & Co.
DENVER AND SALT LAKE CITY: The Mine & Smelter Supply Co.
LONDON: Alfred Herbert, Ltd., 7 Leonard St., Finsbury, E. C.
DÜSSELDORF: de Fries & Co., Act. Ges., Graf Adolf Strasse, 83-87

ANTWERP: Nyssens Freres, 33 Rue des Peignes.
BERLIN: de Fries & Co., Act. Ges., Kloster Strasse, 13-15.
PARIS: Roux Freres & Cie., 54 Boulevard du Temple.
MOSCOW: Alfred Stucken.

ENGINES OF THE ASAHI.

(Continued from page 13.)

feet. Water is circulated through the condenser by two 18-inch centrifugal circulating pumps, each driven by independent engines, having, in addition to suctions from the sea, the usual bilge connections.

The boilers are placed in three separate compartments, there being in all five stokeholds running athwartships. The forward and middle groups consist of ten boilers, placed five in a row, back to back; and the aftermost group consists of a single row of five boilers. There are thus twenty-five boilers with economizers, namely, fifteen boilers having eight elements and seven pairs of tubes; ten boilers having seven elements and seven pairs of tubes; fifteen economizers having eight elements and ten pairs of tubes; and ten economizers having seven elements and ten pairs of tubes. The main feed system consists of three main and three auxiliary pumps of Messrs. G. & J. Weirs' well-known double-acting type.

The main steam supply is conveyed by two lines of steel steam pipes, one line being arranged on each side of the ship, and leading into a large steam separator on the aft boiler room bulkhead. Each line of main steam piping is entirely independent of the other, as are also the connecting pipes from the boilers to each of these lines. Any boiler may, therefore, be cut off from the steam without interfering with the performance of the others in the compartment, as may also any compartment from which these main steam pipes lead, without affecting the working of the other compartment. Any group of boilers may supply steam to any of the engines, and the same remark applies to the feed system.

The auxiliary machines are very numerous, including steam tiller and telemotor gear, air compressors, engines and dynamos for electric power and lighting, searchlights, workshop engines and machines, ventilating fans, refrigerating machinery, capstan engines and cable gear, combined heating and ventilating apparatus for crews' quarters on the patent thermo-tank principle, coaling winches and Temperley's transporters, boat-hoisting winches, etc.

On a high-speed coal-consumption trial it was found that the fuel consumption of this vessel at 12,947 indicated horse-power and 17.5 knots speed was only 1.6 pounds per horse power per hour. On full power trial, the ship having a mean draught of 27 feet 3½ inches, corresponding to 15,340 tons displacement, the collective indicated horse-power was 16,360 and the speed attained 18.3 knots.

TRIP OF INSPECTION.

A party consisting of President Schwab, James Gayley, Geo. Lauder and D. M. Clemson of the Carnegie Steel Co., Judge Jas. H. Reid, president of the P., B. & L. E. R. R., and President Thos. Lynch, of the H. C. Frick Coke Co., left Pittsburg Tuesday, July 17, for an inspection of some of the connected properties of the Carnegie company. At Conneaut, O., the new dock equipment for ore handling, including the Hulett unloader, was seen at work. At Cleveland the party took the passenger steamer Northwest on Wednesday morning and from Duluth will go by special train to the Oliver Iron Mining Co.'s properties on the Mesabi and Vermillion ranges. On the return trip the yards of the American Ship Building Co. at Lorain, O., will be visited and the party will be present at the launching of the Pittsburg Steamship Co.'s new steamer Princeton on Friday, July 27.

VALUE OF STOCKS—LEADING IRON AND STEEL INDUSTRIALS.

Quotations furnished by HERBERT WRIGHT & Co., Cleveland, date of July 18, 1900.

NAME OF STOCK.	OPEN	HIGH	LOW	CLOSE
American Steel & Wire.....	31⅞	32⅝	31⅞	32½
American Steel & Wire, Pfd.....	72	72½	72	72
Federal Steel	32½	33	32¼	32¾
Federal Steel, Pfd.....	66	.....	.....	66
National Steel	23¾	24	23⅞	23⅞
National Steel, Pfd.....	84	.....	.....	84
American Tin Plate	21	.....	.....	21
American Tin Plate, Pfd.....	76	.....	.....	76
American Steel Hoop.....	19	19¾	19	19¾
American Steel Hoop, Pfd.....	67⅛	67¾	67⅛	67¾
Republic Iron & Steel	11⅝	.....	.....	11⅝
Republic Iron & Steel, Pfd	54¾	.....	.....	54¾

FOR SALE.

Good Tug, six years old. Engines 18x20. Boiler allowed 130 pounds steam pressure.

Address Box 284, Ashland, Wis.
August 9

Sealed proposals will be received at the office of the Light-House Engineer, Tompkinsville, N. Y., until 12 o'clock M., August 7, 1900, and then opened, for the metal work and erection of Greens Ledge Light-House, Norwalk Harbor, Conn., in accordance with specifications, copies of which with blank proposals and other information, may be had upon application to D. P. Heap, Lieut. Colonel, Corps of Engineers, U. S. A.
Aug. 2

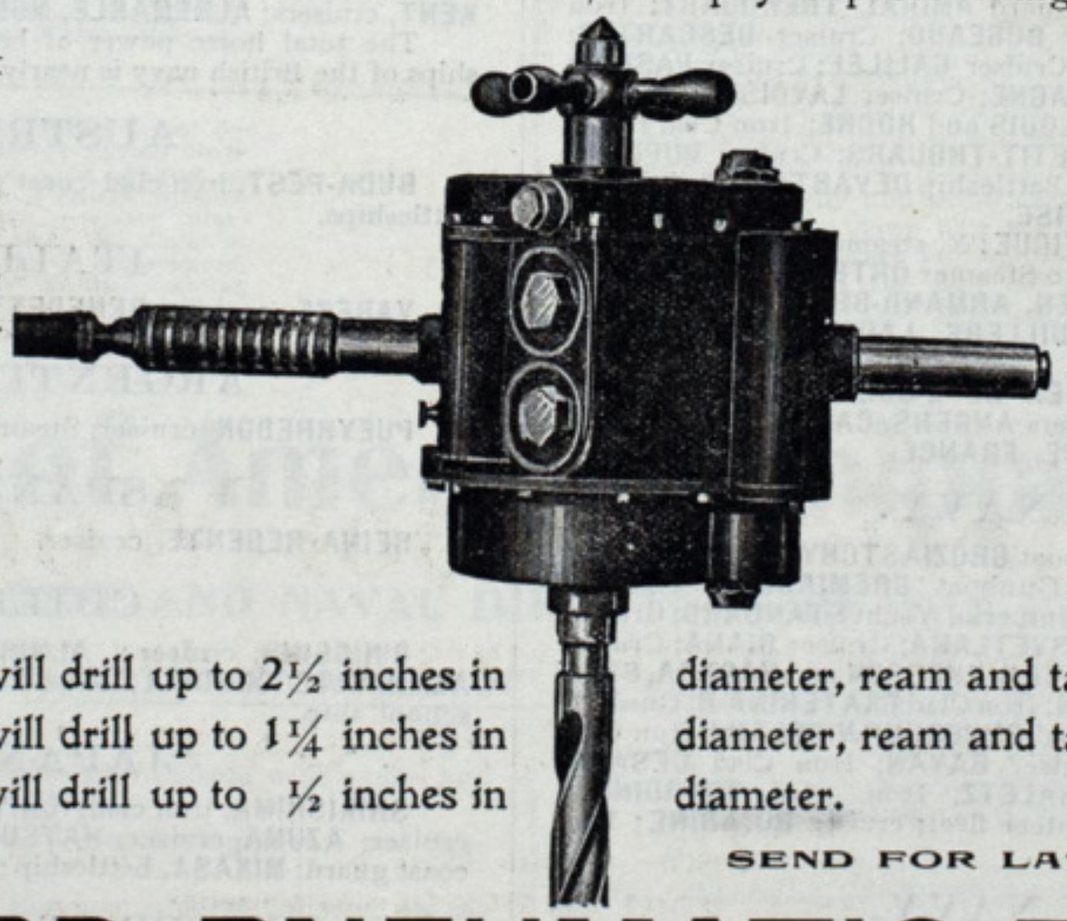
THE ONLY PISTON AIR DRILLS

That have Double-Balanced Piston Valves are the

"LITTLE GIANT"

SPECIALLY DESIGNED FOR SHIP BUILDING.—They consume fifty per cent less air and do far more work than rotary or any other type of air drills. If you want to verify this we will send a machine on trial, and pay express charges both ways.

Our Machines are made to withstand hard service. They can be operated in a bath of oil. Used by 85 per cent of the railways in this country. Absolutely no vibration.



Guaranteed against repair for one year. Made entirely of steel. Can be operated close to a corner and in any position. We can furnish them in any size.

No. 1.—Weight 27 lbs., will drill up to 2½ inches in diameter, ream and tap up to 2 inches.
No. 2.—Weight 17 lbs., will drill up to 1¼ inches in diameter, ream and tap up to 1 inch.
No. 3.—Weight 8 lbs., will drill up to ½ inches in diameter.

SEND FOR LATEST CATALOG.

STANDARD PNEUMATIC TOOL CO.

Manufacturers of Pneumatic Tools of All Kinds,

Marquette Building, CHICAGO. 141 Broadway, NEW YORK.

A FAMOUS SHIP.

Attention is directed to a famous old vessel, the Dessoug, on account of a collision in which she was engaged at Providence, R. I., recently. The Dessoug, owned by the American Towing Co. of Baltimore, is now a coastwise coal barge, but she was once a palatial steamer, and was built for the Khedive of Egypt in 1864 and named the Denton. At that time she was considered one of the fastest and most beautifully appointed vessels afloat, and the Khedive enjoyed her immensely for awhile. But he got tired of her, and in 1879 William H. Vanderbilt bought her to transport the obelisk from Egypt to Central park, New York. Lieutenant Commander Gorringe took command of her, having been detailed for the purpose by the United States government. His mission was accomplished brilliantly in the face of great obstacles.

The obelisk, which weighs 196 tons, was far from the shore line, and buried, besides, deep in sand. It was altogether too heavy for ordinary machinery to be used, and it was carried down on immense platforms with cannon balls under them for rollers. Then it was placed in a crib fixed on a pontoon. The pontoon and ship were lifted in a dry dock, head on to each other, and when this had been accomplished a hole 20 feet long and 12 feet high was cut in the starboard bow of the boat below the water line. Through this the great stone was rolled into the hold of the ship on a groove having an improved ball-bearing attachment, also made of cannon balls. Inside the obelisk was braced along the keelson, and stout shoring fixed about it to make it immovable. After everything was made shipshape and the ribs and plates were replaced at the bow of the steamer, she finally set sail for New York, June 12, 1880. The Khedive's former pleasure craft, with her valuable cargo, passed Gibraltar thirteen days later, having had fine weather, but trouble was in store for her, and when 1,300 miles from shore, on July 6, her propeller shaft broke. Luckily, a spare shaft was aboard, and this was substituted, the boat proceeding meanwhile under sail. Before the stone could be taken from the vessel's hold she had to be cut open again.

Recently the vessel was acquired by the American Towing Co. of Baltimore and was overhauled at the ship yard of R. M. Spedden. She is 233 feet long, 32 feet wide and registers 1,382 tons. The Dessoug was at Providence waiting for a cargo for Baltimore when she was damaged quite seriously by collision with the tug Peter Smith.

BRITISH ADMIRALTY BUYS THE COBRA.

The British admiralty has just purchased from Messrs. Armstrong, Whitworth & Co. the new torpedo boat destroyer Cobra which is fitted with turbine machinery, supplied by Messrs. Parsons & Co., and Yarrow water tube boilers by Messrs. Hawthorne, Leslie & Co., The admiralty promptly bought the vessel upon the result of the recent trial when she achieved a mean speed of 34 knots and a maximum speed of 35.856 knots, thus proving herself to be the fastest boat in the world.

TRADE NOTES.

James W. Hill, master mechanic of the Peoria & Pekin Union Ry. Co., says in a letter to the Buffalo Forge Co., Buffalo, N. Y.:

"We are very highly pleased with your down-draft forge shop equipment which we purchased from you something over three years ago. I consider the down-draft system to be superior to the overhead method of removing smoke and gases. This system makes it cooler for the men, as the draft of air carries the heat away from the men and down underground."

A Philadelphia representative of the Review, in speaking to Mr. Theo. Webster, secretary of Warren, Webster & Co., the big Camden heater concern, asked how the company's business had been during the past six months. Mr. Webster referred to a sheet and said they had one of its largest half years in their history. "We have placed," he said, "58,000 horse power of our feed water heaters alone. Our Webster system department is constantly busy, and our separators are finding an increasing demand. Prices are good—but then we never have any trouble with prices, as people are willing to pay a fair price for a standard article. Our goods have been so long on the market, have been so thoroughly tested, and we have stood so unflinchingly behind the letter and spirit of our guarantees that the people who want our class of goods do not make price an object."

An interesting story of young men who have fitted themselves for good positions in architectural, mechanical and electrical engineering work is told in a little book called "Support Yourself While Learning a Profession." Its motto is "to earn more, learn more," and the value of a technical education and the ease with which it may be acquired are illustrated with many examples of young men who have spent their spare time in study and risen from the ranks to important positions in professional life. The book will be sent free on application to the International Correspondence Schools, Scranton, Pa.

Negotiations are going on between the United States and Spain for the purchase of the fine steel dry dock at Havana, now the property of Spain. The price to be paid is $250,000, and after its purchase it will be towed to Pensacola and stationed at the navy yard. San Juan and Key West were considered besides Pensacola, but after the successful test of coaling facilities there by the North Atlantic squadron a few months ago, the department decided to have the new dock stationed at Pensacola.

The Nickel Plate Road will run a daylight excursion to Niagara Falls on Saturday, July 28, leaving Pearl street 5:30 a. m. and Broadway 5:35 a. m. Three dollars round trip, Toronto $1.00 extra and Thousand Islands $6.50 extra. Tickets good returning until Aug. 1, inclusive. Write, wire, 'phone or call on nearest agent, C. A. Asterlin, T. P. A., Ft. Wayne, Ind., or E. A. Akers, C. P. & T. A., Cleveland, O. 136, July 27

BELLEVILLE GENERATORS.

GRAND PRIZE AT THE WORLD'S FAIR OF 1889.

List of Ocean Steamships on Board which BELLEVILLE GENERATORS are Used.

FRENCH NAVY.

Despatch Boat **VOLTIGEUR**; Squadron's Look-out Ship **MILAN**; Squadron's Look-out Ship **HIRONDELLE**; Gunboat **CROCODILE**; Despatch Boat **ACTIF**; Cruiser **AMIRAL RIGAULT DE GENOUILLY**; Iron Clad Cruiser **ALGER**; Iron Clad Cruiser **LATOUCHE-TREVILLE**; Iron Clad Cruiser **CHANZY**; Iron Clad Cruiser **AMIRAL CHARNER**; Tug **ABERVRAC'H**; Despatch Boat **CAUDAN**; Torpedo Despatch Boat **LEGER**; Torpedo Despatch Boat **LEVRIER**; Battleship **BRENNUS**; Protected Coast Guard **AMIRAL TREHOUART**; Iron Clad Cruiser **BRUIX**; Iron Clad Cruiser **BUGEAUD**; Cruiser **DESCARTES**; Battleship **BOUVET**; Cruiser **POTHUAU**; Cruiser **GALILEE**; Cruiser **PASCAL**; Cruiser **CATINAT**; Battleship **CHARLEMAGNE**; Cruiser **LAVOISIER**; Cruiser **PROTET**; Battleships **GAULOIS, SAINT LOUIS** and **HOCHE**; Iron Clad **IENA**; Cruiser **DESAIX**; Iron Clad Cruiser **DUPETIT-THOUARS**; Cruiser **DUPLEIX**; Cruiser **FURIEUX**; Battleship **NEPTUNE**; Battleship **DEVASTATION**; Cruisers **SULLY, AMIRAL AUBE** and **MARSEILLAISE**.

COMP. GENERALE TRANSATLANTIQUE: X, steamer of the Tarn class.

MESSAGERIES MARITIMES: Cargo Steamer **ORTEGAL**; Mail Steamships **SINDH, AUSTRALIEN, POLYNESIEN, ARMAND-BEHIC, VILLE-DE-LA-CIOTAT, ERNEST-SIMONS, CHILI, CORDILLERE, LAOS, INDUS, TONKIN, ANNAM, ATLANTIQUE**.

COMPAGNIE DES CHEMINS DE FER DE L'OUEST, (Plying between Dieppe and Newhaven): Freight Steamers **ANGERS, CAEN, BREST, CHERBOURG**; Fast Steamers **TAMISE, MANCHE, FRANCE**.

RUSSIAN NAVY.

Iron Clad Frigate **MININE**; Gunboat **GROZIASTCHY**; Imperial Yacht **MAREVO**; Imperial Yacht **STRELA**; Gunboat **GREMIASCHY**; Gunboat **OTVAJNI**; Imperial Yacht **TZAREWNA**; Imperial Yacht **STANDARD**; Cruiser **ROSSYA**; School Ship **VERNY**; Cruiser **SVETLANA**; Cruiser **DIANA**; Cruiser **PALLADA**; Torpedo Transport Boat **BAKAN**; **KHERSON** and **MOSKBA**, Ships of the Volunteer Fleet; Gunboat **GILACH**; Iron Clad **EKATERINA II**; Gunboat **KOUBANETZ**; Cruiser **AURORA**; Iron Clad **EMPEREUR NICOLAS I**; Iron Clad **PRINCE POTIEMKINE DE TAURIDE**; Cruiser **BAYAN**; Iron Clad **CESAREWITCH**; Gunboats **TERETZ** and **OURALETZ**; Iron Clad **BORODINOW**; **SMOLENSK**, Ship of the Russian volunteer fleet; cruiser **BOJARINE**; Iron Clad **SINOPE**.

ENGLISH NAVY.

Torpedo Boat Destroyer **SHARPSHOOTER**; **POWERFUL** and **TERRIBLE**, iron clad cruisers; **GLADIATOR, ARROGANT, FURIOUS, VINDICTIVE**, cruisers; **NIOBE, DIADEM, ANDROMEDA, EUROPA**, cruisers; **CANOPUS, GLORY, GOLIATH, ALBION, OCEAN**, iron clad ships; **ARGONAUT, ARIADNE, AMPHITRITE, SPARTIATE, HERMES, HIGHFLYER** and **HYACINTH**, cruisers; **VENGEANCE**, iron clad; **ALBERT AND VICTORIA**, royal yacht; **CONDOR** and **ROSARIO**, sloops; **CRESSY, ABOUKIR, SUTLEY** and **HOGUE**, cruisers; **IMPLACABLE, FORMIDABLE** and **IRRESISTIBLE, VENERABLE, LONDON, BULWARK**, iron clad ships; **EURYALUS, BACCHANTE**, cruisers; **MUTINE, RINALDO, SHEARWATER**, sloops; **CORNWALLIS, DUNCAN, EXMOUTH, RUSSEL**, iron clad ships; **DRAKE, KING ALFRED, LEVIATHAN, AFRICA**, cruisers; **VESTAL**, sloop; **MONMOUTH**, cruiser; **BEDFORD**, cruiser; **ESSEX, KENT**, cruisers; **ALBEMARLE, MONTAGU**, battleships.

The total horse power of boilers fitted on board the 57 above named ships of the British navy is nearly 900,000.

AUSTRIAN NAVY.

BUDA-PEST, iron clad coast guard; **KAISER KARL VI**, cruiser; **X', X'"**, battleships.

ITALIAN NAVY.

VARESE, cruiser; **BENEDETTO BRIN**, battleship.

ARGENTINE REPUBLIC.

PUEYRREDON, cruiser; Steamships **PUERTO-HUERGO** and **MENDOZA**.

SPANISH NAVY.

REINA REGENTE, cruiser.

CHILIAN NAVY.

O'HIGGINS, cruiser; **ALMIRANTE LYNCH**, torpedo boat destroyer; **ALMIRANTE CONDELL**, torpedo boat destroyer; **JENERAL BAQUEDANO**, school ship.

JAPANESE NAVY.

SHIKISHIMA, iron clad; **CHIYODA**, cruiser; **ASAHI**, iron clad; **IWATE**, cruiser; **AZUMA**, cruiser; **HATSUSE**, iron clad; **ITSUKUSHIMA**, iron clad coast guard; **MIKASA**, battleship; **IZUMO**, cruiser.

UNITED STATES OF AMERICA.

Northern Steamship Co.'s Passenger Steamers **NORTH WEST** and **NORTH LAND**, of 7,000 H. P. each; yachts **SHEARWATER, CORYELL, WILD DUCK, SULTANA**.

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General Information Sent on Demand.

NEW YORK SHIP BUILDING CO.'S PLANT.

Citizens of Woodbury, N. J., gave a banquet last week to Henry G. Morse, president of the New York Ship Building Co. which is establishing a plant at Camden, N. J. In response to a toast Mr. Morse stated that the first keel would in all probability be laid in the new yard within two months. Mr. Morse said that the works when completed would employ fully 5,000 men, and it was expected that the plant would be in full operation by the new year. He also said that it was the company's desire to have as little publicity as possible about the concern and its plans until operations had begun. But the progress had been such that all details had been settled at a meeting of the directors held recently, and, in fact, they had been doing business for some time in some of the departments. As soon as the works were in condition to permit it ship building would begin in earnest, as they had sufficient orders to warrant working at full capacity for some time to come.

The banqueters were later invited by Mr. Morse to make a tour through the works, and they did so, escorted by the president. It was then explained that $6,000,000 would be invested in the establishment complete, and that over $2,500,000 had already been expended in real estate, buildings, machinery and equipments. One thousand men are now at work in the yards, and among them are sixty machinists, who are making tools and putting machinery in place as it is received. The draughting department, which has quarters in the administration building, is working overtime on plans of ships to be constructed at the earliest possible moment. President Morse took pride in showing the many new innovations in ship building, which would make the works of the New York Ship Building Co. one of the finest in the world. Everything will be run by electricity, steam being utilized only for the immense dynamos, among which are the largest and latest improved electrical engines ever constructed. There will be many new devices in operation, which will minimize the employment of unskilled labor.

The greatest novelty connected with the institution, when completed, will be the large glass-covered dry dock and ship building shop, for which a small portion of the steel frame is already in place. As it now appears, there is the steel structural work with three gables facing on the water front of the Delaware river, rising to a height of 150 feet and covering a frontage on the water of about 400 feet. The 200 feet to the south will be utilized for a completely-encased series of shops, so that work can be proceeded with during the winter and summer alike. These shops will be built of steel and with glass walls, and will be under one glass roof. The height will be 150 feet and the width 200 feet. This glass and steel structure will extend 900 feet out into the Delaware river, and will easily permit of work being done simultaneously on four of the largest naval vessels, from the keel upward. This part of the yards will eclipse anything of the kind in the world, and will avoid the usual delays incumbent on the unpropitious seasons and the weather. Here, too, the hoisting machinery, cranes, riveting and other implements will be worked by electricity, and improvements that have hitherto been unknown will be in operation in this department. There will be added to the ship yards foundries and steel armor plate works, so that the concern can furnish every article of a vessel of any description from its own plant.

U. S. Engineer Office, Galveston, Tex., July 10, 1900. Sealed bids, in triplicate, for Improving Harbor at Brazos Santiago, Tex., by hire of dredging plant, will be received until 2 p. m., July 30, 1900, and then publicly opened. For information apply to C. S. Riche, Capt., Engrs. July 26

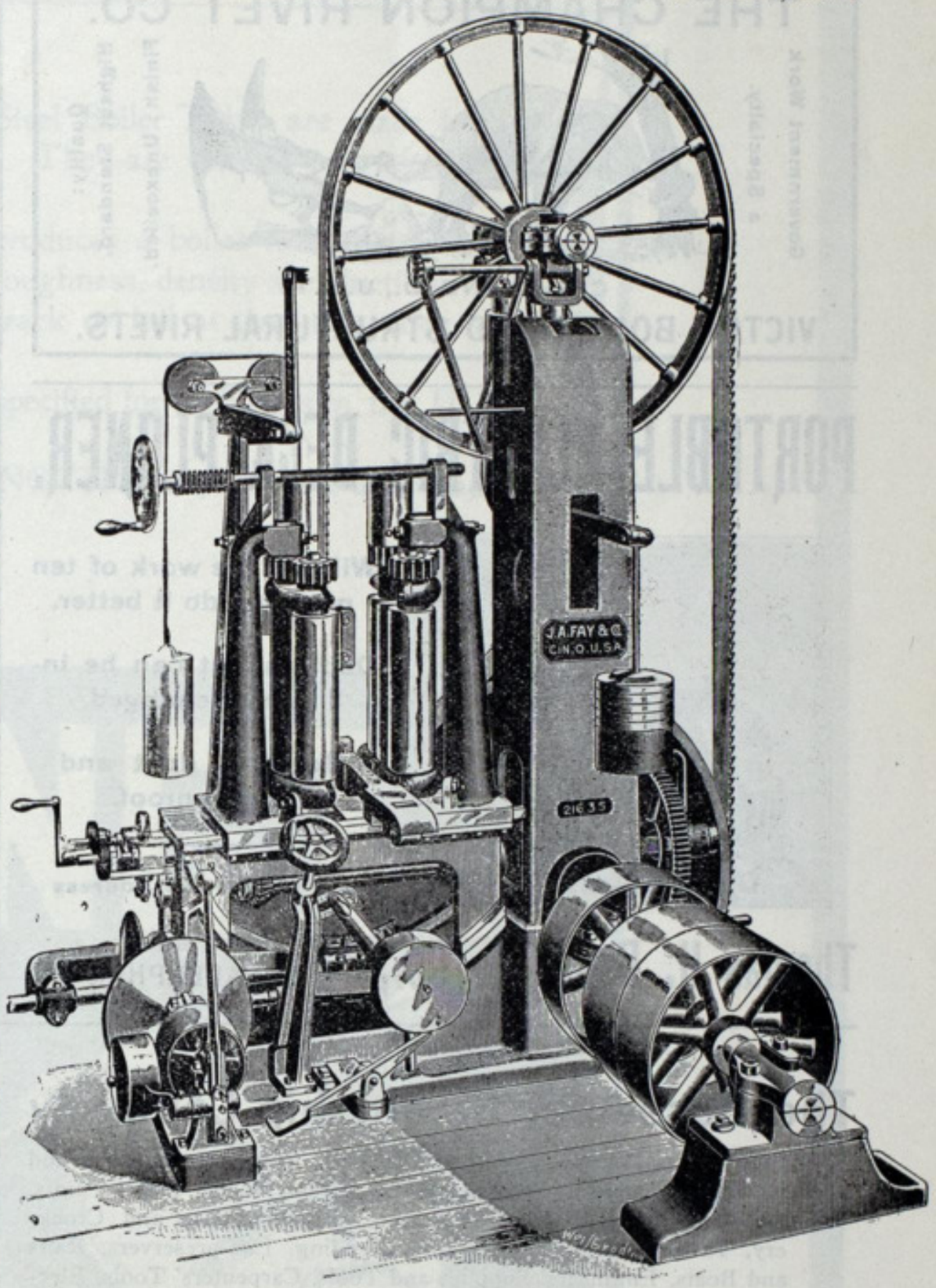
U. S. Engineer Office, 185 Euclid Ave., Cleveland, O., June 21, 1900. Sealed proposals for Removing and Rebuilding Part of West Pier at Huron Harbor, Ohio, will be received here until 2 p. m., standard time, Saturday, July 21, 1900, and then publicly opened. Information furnished on application. Jared A. Smith, Col., Engrs. July 19

Sealed proposals for furnishing armor for naval vessels will be received at the Navy Department until 12 o'clock, noon, August 10, 1900, when they will be publicly opened. Forms of proposals and all necessary information may be obtained from the Chief of the Bureau of Ordnance, Navy Department, Washington, D. C. F. W. Hackett, Acting Secretary. 6-18-1900. July 28

FAY BAND RE-SAW.

The machine here illustrated is a new one, recently placed on the market by J. A. Fay & Egan Co. of No. 325-345 West Front street, Cincinnati, O., and known as the Fay No. 7 band re-saw.

This machine will be found very valuable for converting lumber into panels, for general re-sawing, etc. It will saw either straight or beveling, and owing to the position of the rolls with relation to the blade, short



pieces can be re-sawed to advantage. It will re-saw material 30 inches wide and 13 inches in thickness; will re-saw to the center of 10 inches, and will saw from the side of a timber 8 inches thick.

The wheels are made entirely of iron and steel, the lower one being solid and of ample strength and weight, and the upper being fitted with spokes placed in a staggering position. There is an improved method of maintaining the tension on the saw, which is most sensitive. The feed is very powerful, consisting of four feed rolls 5 inches in diameter, strongly geared, and is continuous and perfect. The adjustments are made very rapidly and accurately. Altogether this new machine will be found to contain many new mechanical arrangements and conveniences, and the manufacturers will be pleased to furnish any of our readers who may be interested and will write them, prices and full particulars, and will also forward their large new illustrated catalogue and colored poster free on application.

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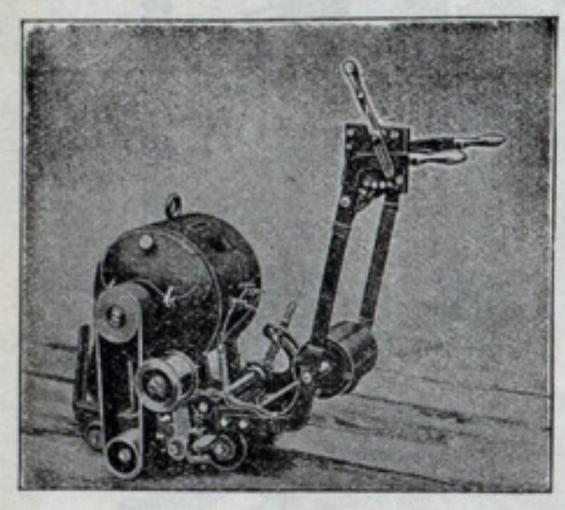

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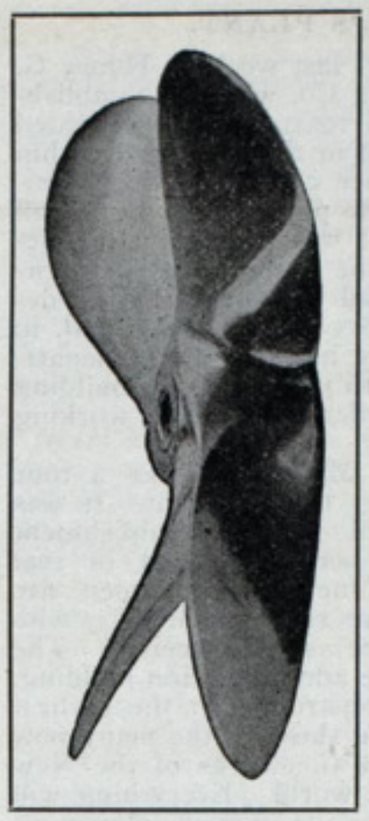

West Superior, Wis., Oct. 25, 1899.

A. Wells Case & Son,
Highland Park, Conn.—

Gentlemen: Your favor of the 16th inst. duly received. As I have stated before, the 32-inch wheel you sent me early this season has given entire satisfaction. We are able to turn up with it nearly as many turns as we did with the 28-inch wheel and get about a mile an hour more speed out of it. I could only confirm other testimonials you have to the effect that your wheel is the most satisfactory I have ever had any experience with. It may be that I shall build a larger boat during the winter, and if so will certainly call upon you for a wheel for it.

Yours very truly,
ROBERT KELLY.

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Messrs. A. Wells Case & Son,
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Sirs: I have been experimenting with propeller wheels on steam and gas engine boats for nine years, and desire to place myself on record as saying that without doubt the Case wheel is the best to date. Our launch, the Vigo, is equipped with a 16-horse-power Russ motor and a Case wheel, and the combination has produced the fastest naphtha launch of her size afloat. She is 40x7½x3½, and has a trial speed of 12½ miles. With best wishes for the future success of the Case wheel, I am,

Yours very truly,
H. C. MONSELL.

Elkhart, Ind., Feb. 1st, 1900.

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Gentlemen: Your favor of Jan. 29th is just here. Your wheel on the Sultana gives most excellent satisfaction. I believe it to be the best wheel manufactured and advise all owners of steam yachts, who desire to increase the speed of their boats, to adopt it. If I can be of any service to you in recommending the Case wheel to prospective buyers, kindly refer them to me.

With best wishes, I am, Truly yours,
C. G. CONN.

Crown Island, N. Y., Sept. 22, 1899.

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Gentlemen: I have now given the wheel you sent me a fair test and can say that it surpasses anyof the other four wheels which I have had on the Crusader. The vibration is less and the strain on the engine is less and speed is greater. Another season, I hope to have you make me a special bronze wheel and I believe you can give me still more speed.

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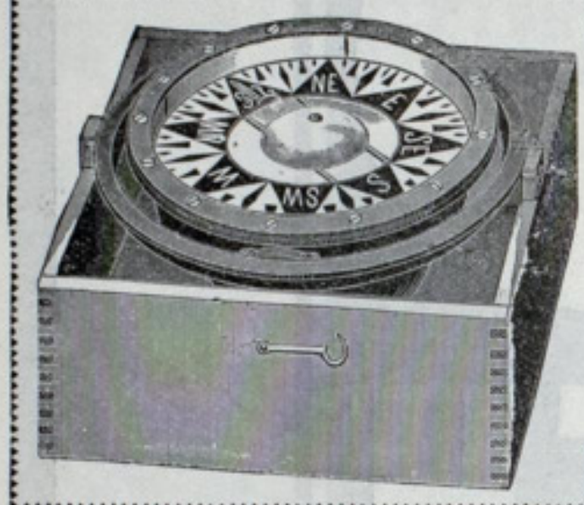

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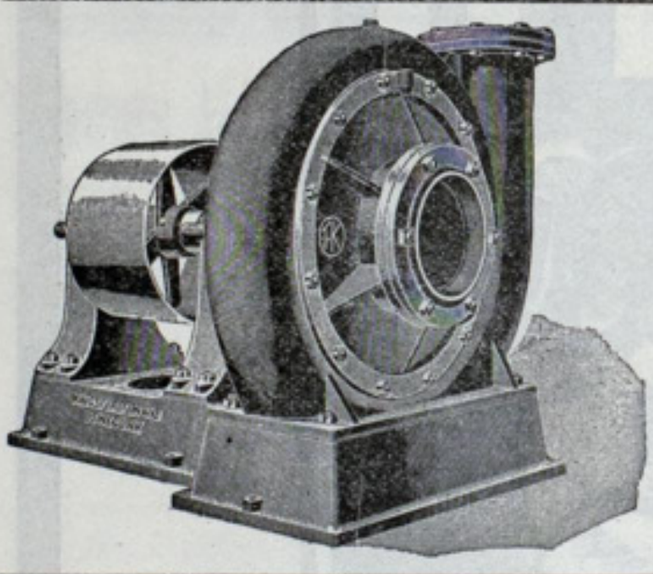

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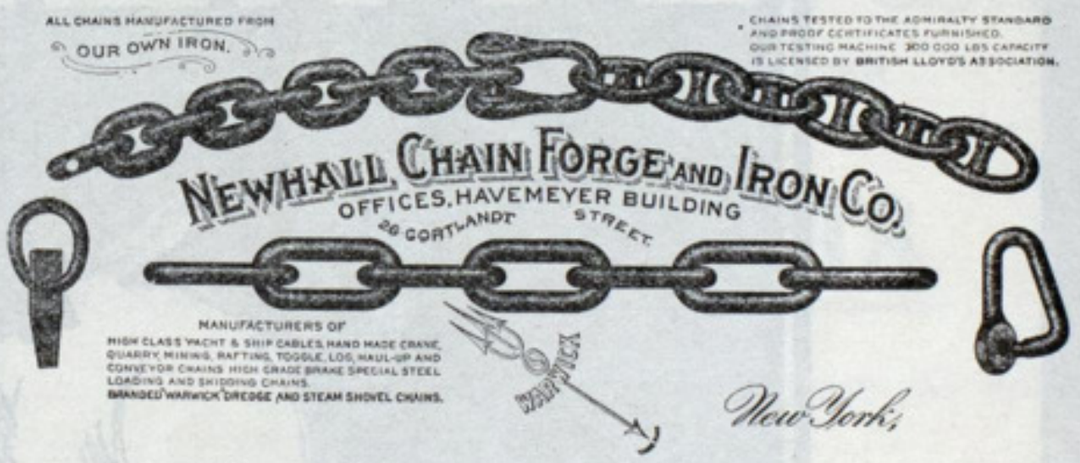

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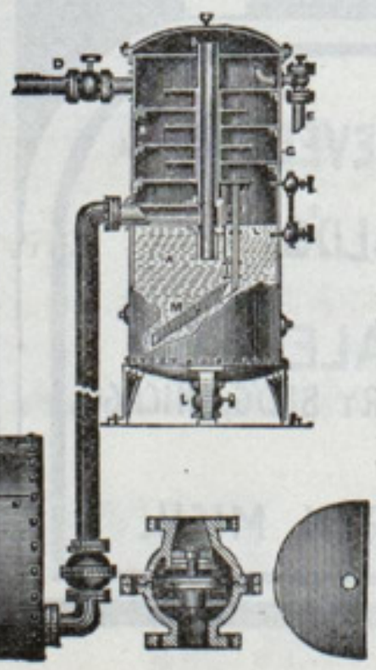

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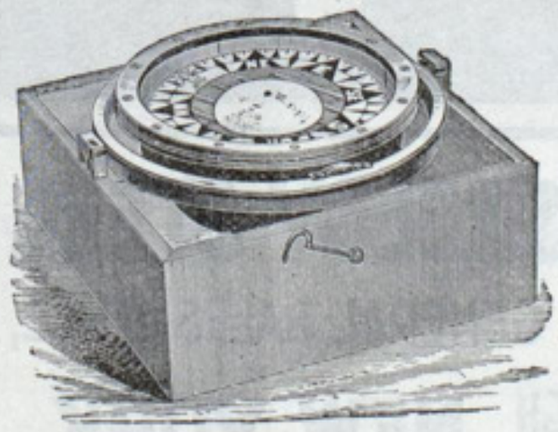

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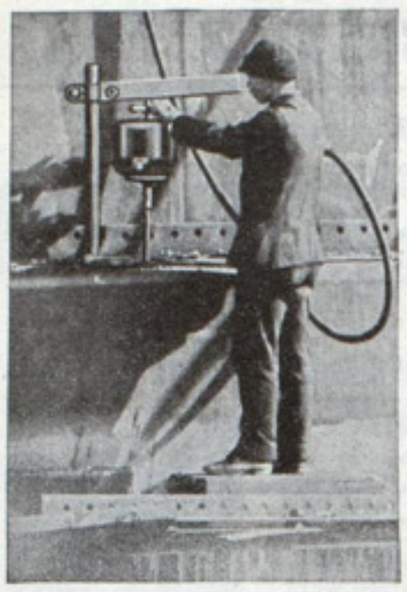

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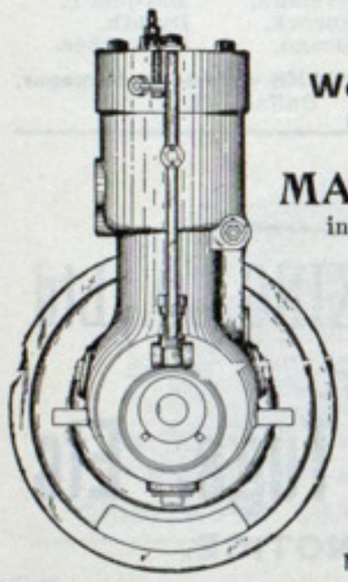

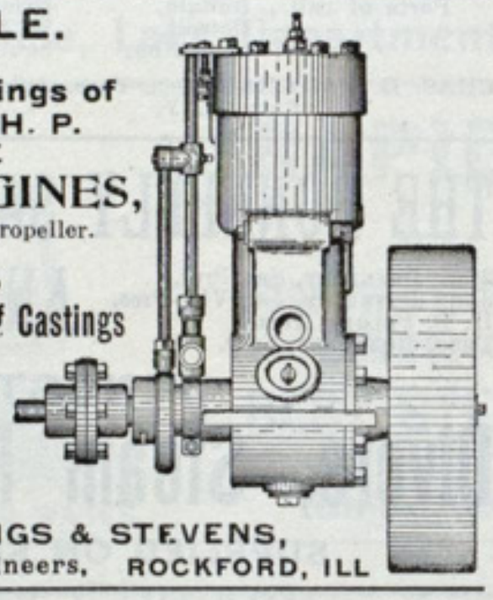

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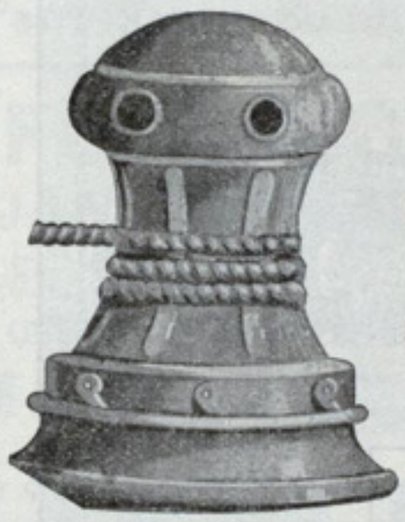

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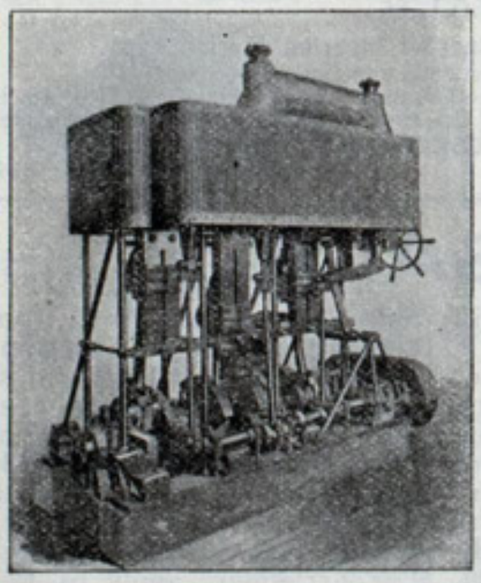

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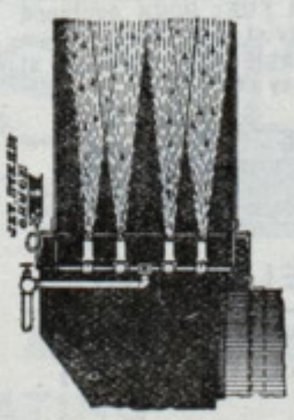

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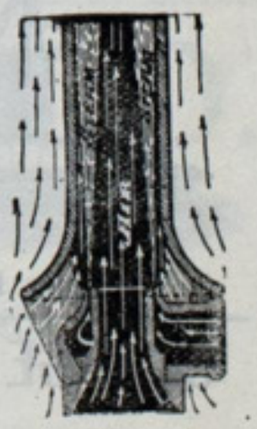

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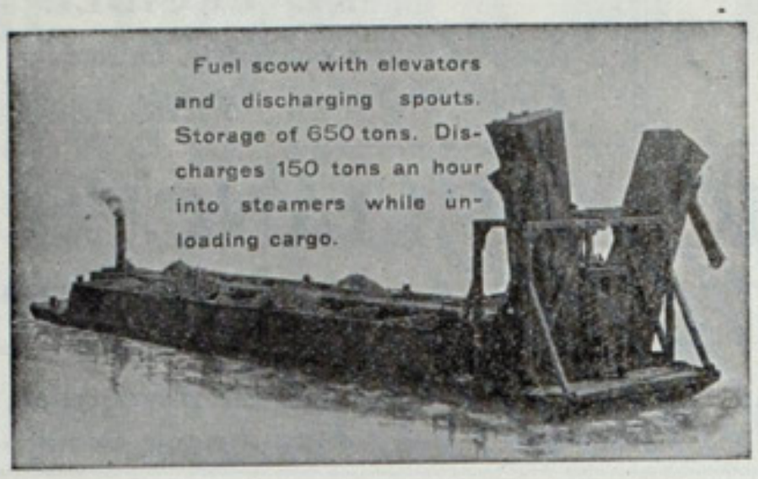

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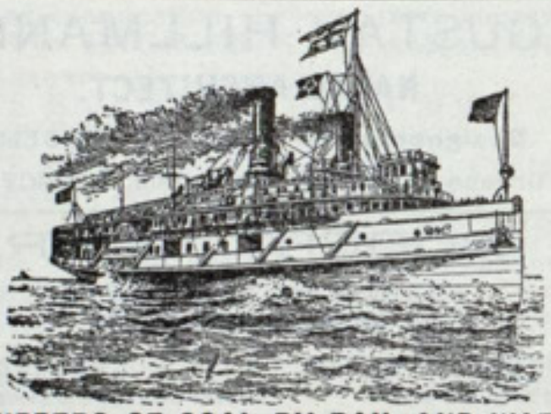

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Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg. Co..Philadelphia.
Newport News Ship Bldg. Co...Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roberts Safety Water Tube Boiler Co....New York.
Stirling, The Co.....Chicago.
Trigg, Wm. R. Co.....Richmond, Va.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

BOILER COMPOUNDS.

Dearborn Drug & Chemical Works.....Chicago.

BOILER TUBES, SEAMLESS, WELDLESS.

Atlantic Tube Co.....Pittsburg.
Shelby Steel Tube Co.....Cleveland.

BOILER FURNACES, FIRE FRONTS, ETC.

Continental Iron Works.....New York.

BOILER RIVETS.

Bourne Fuller Co.....Cleveland.
Champion Rivet Co.....Cleveland.

BOILER STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O

BOLT CUTTERS.

American Tool Works Co. (The).....Cincinnati.
Niles Tool Works Co.....Hamilton, O.

BORING AND TURNING MILLS.

American Tool Works Co. (The).....Cincinnati
Niles Tool Works Co.....Hamilton, O.

BRASS AND BRONZE CASTINGS.

Cramp, Wm. & Sons.....Philadelphia.
Illinois Smelting & Refining Works.....Chicago.
Phosphor Bronze Smelting Co.....Philadelphia.

BRASS AND COPPER SHEET, ROD, WIRE AND TUBES.

Hungerford Brass & Copper Co., U. T.....New York.

BRIDGES, BUILDERS OF.

American Bridge Co.....New York.
Scherzer Rolling Lift Bridge Co.....Chicago.

BUCKETS, ORE AND COAL.

Brown Hoisting & Conveying Mach. Co..Cleveland.
McMyler Mnfg. Co.....Cleveland.
Webster, Camp & Lane Machine Co.....Akron, O.

CABIN AND CABINET FINISHING WOODS.

Martin-Barriss Co.....Cleveland.

CAPSTANS.

American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

CHAINS.

Lebanon Chain Works.....Lebanon, Pa.
Monongahela Iron & Steel Co.....Pittsburg.
Newhall Chain Forge & Iron Co.....New York.
Standard Chain Co.....Pittsburg.

CHAIN HOISTS.

Boston & Lockport Block Co.....Boston, Mass.

CHUCKING MACHINES.

American Tool Works Co. (The).....Cincinnati.
Niles Tool Works Co.....Hamilton, O.

CIRCULATOR, EQUILIBRIUM with Steam Heating Attachment.

Bloomsburg & Co., H.....Newport News, Va.

CLOCKS (Marine), CHRONOMETERS, BELLS.

Ashton Valve Co.....Boston.
Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

COAL PRODUCERS AND SHIPPERS.

Castner, Curran & Bullitt.....Philadelphia.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co....Buffalo.
Scott Co., W. L.....Erie, Pa.

COAL AND ORE HANDLING MACHINERY.

Brown Hoisting & Conveying Mach. Co..Cleveland.
Lidgerwood Mnfg. Co.....New York.
McMyler Mnfg. Co.....Cleveland.

COMPASSES.

Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

COMPASS ADJUSTER.

Simpson, Geo. A.....Sault Ste. Marie, Mich.

COPPER SHEET, WIRE AND ROD.

Hungerford Brass & Copper Co., U. T.....New York.

CORK JACKETS AND RINGS.

Armstrong Cork Co.....Pittsburgh, Pa.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

CORRESPONDENCE SCHOOL—ENGINEERING AND NAVIGATION.

International Correspondence Schools.....Scranton, Pa.

CRANES, CONVEYORS, HOISTS.

Brown Hoisting & Conveying Mach. Co..Cleveland.
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mnfg. Co.....New York.
McMyler Mnfg. Co.....Cleveland.
Sprague Electric Co.....New York.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

CRANK PINS.

Bethlehem Steel Co.....Bethlehem, So. Pa.

DECK PLANING MACHINERY.

Dallett, Thos. H. & Co.....Philadelphia

DECK SEAMS, COMPOSITION FOR.

Cole & Kuhls.....Brooklyn, N. Y.

DRILLS—ROCK DRILLS, COAL CUTTERS, ETC.

Ingersoll-Sergeant Drill Co.....New York

DRILL PRESSES—DRILLS OF ALL KINDS.

American Tool Works Co. (The).....Cincinnati.
Cleveland Punch & Shear Works Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.

DRILLS, PNEUMATIC.

Chicago Pneumatic Tool Co.....Chicago.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.

DRYING APPARATUS.

Sturtevant Co., B. F.....Boston.

DRY DOCKS.

American Ship Building Co.....Cleveland.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Chicago Ship Building Co.....Chicago.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Harlan & Hollingsworth Co.....Wilmington, Del.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Newport News Ship Bldg Co....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Townsend & Downey Ship Bldg. Co....New York.
Union Dry Dock Co.....Buffalo.
Union Iron Works.....San Francisco.

ELEVATORS.

Morse, Williams & Co.....Philadelphia.

ELECTRIC AUTOMATIC WHISTLE OPERATORS.

Signal & Control Co.....New York.

ELECTRIC LIGHT AND POWER PLANTS.

Buffalo Forge Co.....Buffalo.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Pelton Engineering Co.....Cleveland.
Sprague Electric Co.....New York.
Sturtevant, B. F Co.....Boston.
Westinghouse Electric & Mnfg. Co..Pittsburgh, Pa.

ELECTRIC HOISTS AND CRANES.

Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mnfg. Co.....New York.
Sprague Electric Co.....New York.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

ENGINE BUILDERS, MARINE.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Chicago Ship Building Co.....Chicago.
Chase Machine Co.....Cleveland.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Engine Co.....Weymouth, Mass.
Gas Engine & Power Co., and Chas. L. Seabury & Co., Consolidated.....New York.
Giddings & Stevens.....Rockford, Ill.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg Co..Philadelphia.
Newport News Ship Bldg Co..Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.

Cory, Chas. & Son.....New York.

ENGINEERS, MARINE AND MECHANICAL.

Giddings & Stevens.....Rockford, Ill.
Hillman, Gustav.....Brooklyn.
Hunt, Robt. W. & Co.....Chicago.
Miller, Walter.....Cleveland.
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.
Powell, Ambrose V.....Chicago.
See, Horace.....New York.
Simpson, W. L.....5th and Buttonwood, Philadelphia.
Wood, W. J.....Chicago.

FANS FOR VENTILATION, EXHAUST, ETC.

Buffalo Forge Co.....Buffalo.
Sprague Electric Co.....New York.
Sturtevant, B. F. Co.....Boston.

FEED WATER PURIFIERS AND HEATERS.

Learmonth, Robert.....Buffalo.
Warren Webster & Co.....Camden, N. J.
Keystone Engine & Machine Works, W. L. Simpson, Engineer.....Philadelphia.

FORGES.

Buffalo Forge Co.....Buffalo.
Sturtevant Co., B. F.....Boston.

FORGINGS, IRON AND STEEL.

Bethlehem Steel Co.....South Bethlehem.
Bourne-Fuller Co.....Cleveland

FIXTURES FOR LAMPS, OIL AND ELECTRIC.

Page Bros. & Co.....Boston.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

FLUSHOMETERS.
Kenney, The Co.....New York.

FURNACES FOR BOILERS.
Continental Iron Works.....New York.

FUELING COMPANIES AND COAL DEALERS.
Castner, Curran & Bullitt (Pocahontas)..... Philadelphia.
Graham, James & Co.....Detroit.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co..Buffalo.
Smith, Stanley B. & Co.....Detroit.
Scott Co., W. L.....Erie, Pa.
Youghiogheny & Lehigh Coal Co.....Chicago.

GAS BUOYS.
Safety Car Heating & Lighting Co.....New York.

GAS AND GASOLINE ENGINES.
Giddings & Stevens.....Rockford, Ill.
McMyler Mnfg. Co.....Cleveland.
Olds Motor Works.....Detroit.

GAGES, STEAM AND VACUUM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

GRAPHITE.
Dixon Crucible Co., Joseph.....Jersey City, N. J.

HAMMERS, PNEUMATIC.
Chicago Pneumatic Tool Co.....Chicago.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.

HAMMERS, POWER DROP.
Chase Machine Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.

HAWSERS, WIRE.
American Steel & Wire Co.....Chicago.

HEATING APPARATUS.
Sturtevant Co., B. F.....Boston.

HOISTS FOR CARGO, ETC.
American Ship Building Co.....Cleveland.
Brown Hoisting & Conveying Mach. Co..Cleveland.
Chase Machine Co.....Cleveland.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....New York.
Hodge, S. F. & Co.....Detroit.
Hyde Windlass Co.....Bath, Me.
Lidgerwood Mnfg. Co.....New York.
McMyler Mnfg. Co.....Cleveland.
Marine Iron Co.....Bay City.
Sprague Electric Co.....New York.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

INDICATORS FOR STEAM ENGINES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

INJECTORS.
Jenkins Bros.....New York.
Penberthy Injector Co.....Detroit.

INSURANCE, MARINE.
Brown & Co.....Buffalo.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Gibbs & Joys.....Milwaukee.
Hawgood & Moore.....Cleveland.
Helm, D. T. & Co.....Duluth, Minn.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
La Salle & Co.....Duluth.
Mitchell & Co.....Cleveland.
Osborn & Co., F. H.....Chicago.
Pauly, H. J.....Milwaukee.
Parker, A. A. & W. B.....Detroit.
Peck, Chas. E. & W. F.....New York and Chicago.
Richardson, W. C.....Cleveland.

IRON ORE AND PIG IRON.
Bourne-Fuller Co.....Cleveland.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.

IRON OR STEEL STAYBOLTS, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

LATHES OF ALL KINDS.
American Tool Works Co. (The).....Cincinnati.
Niles Tool Works Co.....Hamilton, O.

LAUNCHES—NAPHTHA, ELECTRIC.
Electric Boat Co.....New York.
Gas Engine & Power Co.....New York.

LIFE PRESERVERS, LIFE BOATS, BUOYS, RAFTS, ETC.
Armstrong Cork Co.....Pittsburg.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

LIGHTS, SIDE AND SIGNAL.
Page Bros. & Co.....Boston.

LUBRICATING PUMPS.
Phenix Metallic Packing Co.....Chicago.
Sterling Lubricator Co.....Rochester, N. Y.

MACHINE TOOLS.
American Tool Works Co. (The).....Cincinnati.
Niles Tool Works Co.....Hamilton, O.
Pelton Engineering Co.....Cleveland.

MACHINE TOOLS (WOOD WORKING).
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

MATTRESSES, CUSHIONS, BEDDING.
Fogg, M. W.....New York.

METALLIC PACKING.
Katzenstein, L. & Co.....New York.
Phenix Metallic Packing Co.....Chicago.
U. S. Metallic Packing Co.....Philadelphia.

METALS FOR BEARINGS.
Cramp, Wm. & Sons.....Philadelphia.
Magnolia Metal Co.....New York.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.

METAL POLISH.
Bertram's Oil Polish Co.....Boston, Mass.

MILLING MACHINES OF ALL KINDS.
American Tool Works Co. (The).....Cincinnati.
Niles Tool Works Co.....Hamilton, O.

NAUTICAL INSTRUMENTS.
Bliss, John & Co.....New York.
Ritchie & Sons, E. S.....Brookline, Mass.

NAVAL ARCHITECTS.
Curr, Robert.....Cleveland.
Hillman, Gustav.....Brooklyn.
See, Horace.....New York.
Wood, W. J.....Chicago.

NICKEL STEEL FORGINGS.
Bethlehem Steel Co.....So. Bethlehem, Pa.

OAKUM.
Stratford Oakum Co., Geo.....Jersey City, N. J.

OILS AND LUBRICANTS.
Dixon Crucible Co., Jos.....Jersey City, N. J.
Standard Oil Co.....Cleveland.

PACKING.
Jenkins Bros.....New York.
Katzenstein, L. & Co.....New York.
Phenix Metallic Packing Co.....Chicago.
U. S. Metallic Packing Co.....Philadelphia.

PAINTS.
Baker, Howard H. & Co.....Buffalo.
Smith, Edward & Co.....New York.
Upson-Walton Co.....Cleveland.

PAINTING MACHINES, PNEUMATIC.
Chicago Pneumatic Tool Co.....Chicago.

PATENT ATTORNEYS.
Thurston & Bates.....Cleveland.

PATTERN SHOP MACHINERY.
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

PIPE, WROUGHT IRON.
Bourne-Fuller Co.....Cleveland.

PLANERS OF ALL KINDS.
American Tool Works Co. (The).....Cincinnati.
Niles Tool Works Co.....Hamilton, O.

PLANING MILL MACHINERY.
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

PLUMBING, MARINE.
Ellis Marine Plumbing Co.....New York.
Mott Iron Works, J. L.....New York.
Sands, Alfred B. & Son.....New York.
Kenney, The Co.....New York.

PNEUMATIC TOOLS.
Chicago Pneumatic Tool Co.....Chicago.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.

POLISH FOR METALS.
Bertram's Oil Polish Co.....Boston, Mass.

PROPELLER WHEELS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works Ltd.....Bath, Me.
Case, A. Wells & Son.....Highland Park, Conn.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fore River Engine Co.....Weymouth, Mass
Hardy, John B.....Tacoma, Wash.
Hyde Windlass Co.....Bath Me.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
MacKinnon Mfg Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg Co...Philadelphia.
Newport News Ship Bldg. Co..Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

PROJECTORS, ELECTRIC.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Sprague Electric Co.....New York.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

PUMPS FOR VARIOUS PURPOSES.
Blake, Geo. F. Mnfg. Co.....New York.
Davidson, M. T.....Brooklyn, N. Y.
Kingsford Foundry & Machine Works.....Oswego, N. Y.
Van Duzen, The E. W. Co.....Cincinnati.
Worthington, Henry R.....New York.

PUNCHES, RIVETERS, SHEARS.
American Tool Works Co. (The).....Cincinnati.
Cleveland Punch & Shear Works Co.....Cleveland.
New Doty Mnfg. Co.....Janesville, Wis.
Niles Tool Works Co.....Hamilton, O.
Wood & Co., R. D.....Philadelphia.

REGISTER FOR CLASSIFICATION OF VESSELS.
Great Lakes Register.....Cleveland.

RELEASING HOOKS FOR DETACHING BOATS.
Standard Aut. Releasing Hook Co.....New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.
Bourne-Fuller Co.....Cleveland.
Champion Rivet Co.....Cleveland.

RIGGING ROPE (WIRE).
American Steel & Wire Co.....Chicago.

RUBBER INSULATED WIRES.
Roebling's Sons, John A..New York and Cleveland.
American Steel & Wire Co.....Chicago.

SAFETY VALVES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

SAIL MAKERS.
Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.
Wilson & Silsby.....Boston.

SALVAGE COMPANIES.
See wrecking companies.

SCHOOLS, CORRESPONDENCE—ENGINEERING AND NAVIGATION.
International Correspondence Schools.....Scranton, Pa.

SCREW MACHINES.
American Tool Works Co. (The).....Cincinnati.
Niles Tool Works Co.....Hamilton, O.

SEARCH LIGHTS.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Sprague Electric Co.....New York.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

SEPARATORS, (CENTRIFUGAL).
Keystone Engine & Machine Works, W. L. Simpson, Engineer.....Philadelphia.

SHAPERS.
American Tool Works Co. (The).....Cincinnati.
Niles Tool Works Co.....Hamilton, O.

SHEARS.
See punches, riveters and shears.

SHIP AND BOILER PLATES AND SHAPES.
Bourne-Fuller Co.....Cleveland.

SHIP BUILDERS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Shipbuilding Co.....Detroit.
Fore River Engine Co.....Weymouth, Mass.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg. Co..Philadelphia.
Newport News Ship Bldg. Co...Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Townsend & Downey Ship Bldg. Co.....New York.
Trigg, Wm. R. Co.....Richmond, Va.
Union Dry Dock Co.....Buffalo.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

SHIP CHANDLERS.
Baker, Howard H. & Co.....Buffalo.
Marine Supply Co.....Fairport Harbor, O.
Moran, Bros. Co.....Seattle, Wash.
Upson-Walton Co.....Cleveland.

SPARS—LARGE SIZES.
Moran Bros. Co.....Seattle, Wash.

STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSEL FOR SALE.
Holmes, Samuel.....New York.

STEEL OR IRON STAYBOLTS, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

STEAMSHIP LINES, PASS. AND FREIGHT.
American Line.....New York.
Erie & Western Trans. Co.....Buffalo.
International Nav. Co.....Philadelphia.
Red Star Line.....New York.

STEEL SHAFTS, SOLID OR HOLLOW.
Bethlehem Steel Co.....So. Bethlehem, Pa.

STEERING APPARATUS.
American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Detroit Shipbuilding Co.....Detroit.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Queen City Engineering Co.....Buffalo.
Sheriffs Mfg. Co.....Milwaukee.

STOCKS, BONDS, SECURITIES.
Wright, Herbert & Co.....Cleveland.

STOCKLESS ANCHORS.
Baldt Anchor Co.....Chester, Pa.
International Anchor Co.....Cleveland.

STRUCTURES OF STEEL, BUILDERS OF.
American Bridge Co.....New York.

SURVEYORS, MARINE.
Curr, Robert.....Cleveland.
Gibbs & Joys.....Milwaukee.

TELEGRAPH—DECK AND ENGINE ROOM.
Cory, Chas. & Son.....New York.

TESTS OF MATERIAL.
Hunt, Robert W. & Co.....Chicago.
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.

THERMOMETERS FOR MECHANICAL PURPOSES.
Helios-Upton Co.....Peabody, Mass.

THRUST COLLARS FOR PROPELLER SHAFTS.
Ball Bearing Co.....Boston, Mass.

TIMBER—LARGE PIECES.
Moran Bros. Co.....Seattle, Wash.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.
American Tool Works Co. (The).....Cincinnati.
Chicago Pneumatic Tool Co.....Chicago.
Cleveland Punch & Shear Works Co.....Cleveland.
New Doty Mnfg. Co.....Janesville, Wis.
Niles Tool Works Co.....Hamilton, O.
Pelton Engineering Co.....Cleveland.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.
Wood & Co., R. D.....Philadelphia.

TOOLS, WOOD WORKING.
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

TRUCKS.
Boston & Lockport Block Co.....Boston, Mass.

TOWING MACHINES.
American Ship Windlass Co.....Providence, R. I.
Chase Machine Co.....Cleveland.
Playfair's Barge & Tug Line.....Midland, Ont.

TOWING COMPANIES.
Calvin Co., The.....Kingston, Ont.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Swain Wrecking Co.....Detroit.

TUBING FOR BOILERS.
Atlantic Tube Co.....Pittsburg.
Shelby Steel Tube Co.....Cleveland.

TUBES, SEAMLESS DRAWN, BRASS AND COPPER.
Hungerford Brass & Copper Co., U. T.....New York.

VALVES, STEAM SPECIALTIES, ETC.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Jenkins Bros.....New York.

VARNISH MAKERS, COLOR GRINDERS, ETC.
Smith, Edward & Co.....New York.

VARNISH PAINT.
Mair, John & Son.....Philadelphia.

VESSEL AND FREIGHT AGENTS.
Boland, John J.....Buffalo.
Brown & Co.....Buffalo.
Bull & Co, A. H.....New York.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Gibbs & Joys.....Milwaukee.
Hall & Root.....Buffalo.
Hawgood & Moore.....Cleveland.
Helm, D. T. & Co.....Duluth, Minn.
Holmes, Samuel.....New York.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
Mitchell & Co.....Cleveland.
Moffat & O'Brien.....San Francisco.
Pauly, H. J.....Milwaukee.
Richardson, W. C.....Cleveland.

VENTILATING APPARATUS FOR SHIPS.
Buffalo Forge Co.....Buffalo.
Sprague Electric Co.....New York.
Sturtevant Co., B. F.....Boston.

WIRE ROPE AND WIRE ROPE FITTINGS.
American Steel & Wire Co.....Chicago.
Baker, H. H. & Co.....Buffalo.
Roebling's Sons, John A..New York and Cleveland.
Upson-Walton Co.....Cleveland.

WHISTLES, STEAM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Signal & Control Co.....New York.

WINDLASSES.
American Ship Windlass Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.

WINCHES.
American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

WOOD WORKING MACHINERY.
Fay & Egan Co., J. A.....Cincinnati, O.
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No. 2,	Day Express	†9 05 pm	†9 20 pm
No. 126,	Norwalk Accommodation	†7 55 am	.....
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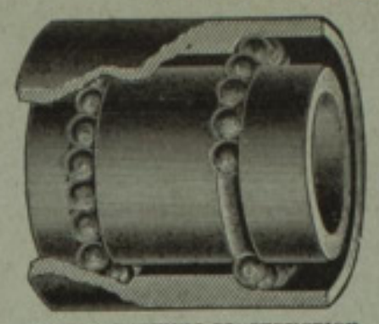

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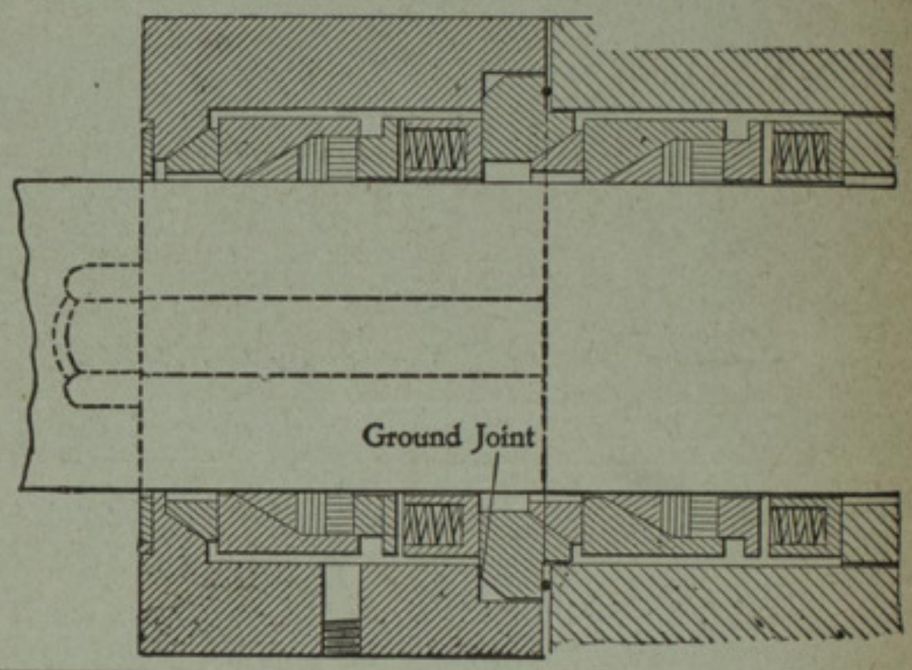

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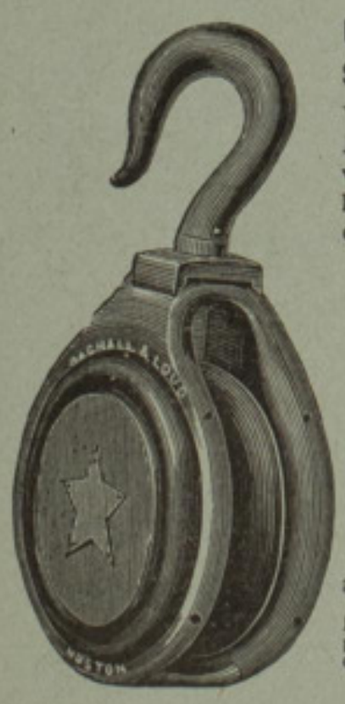

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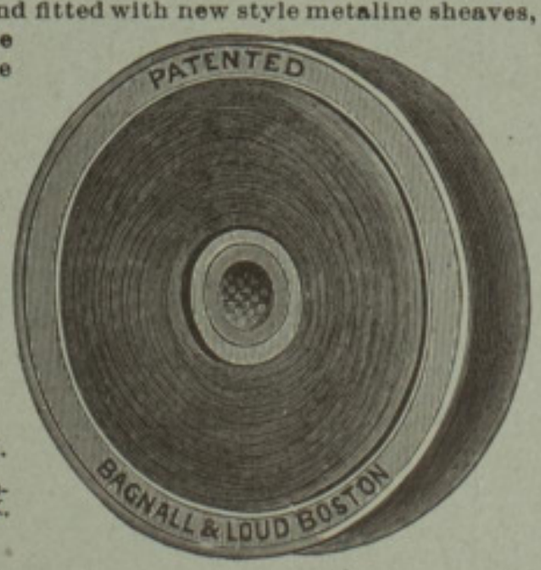

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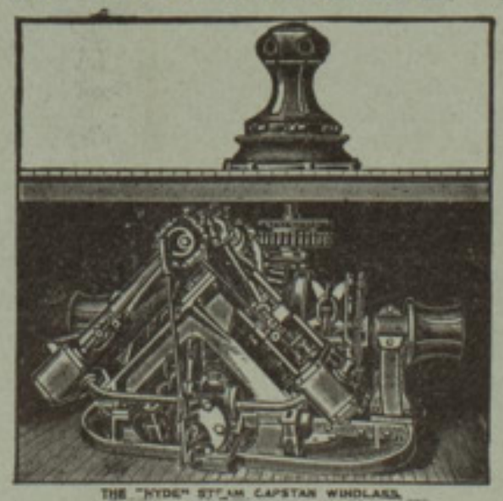

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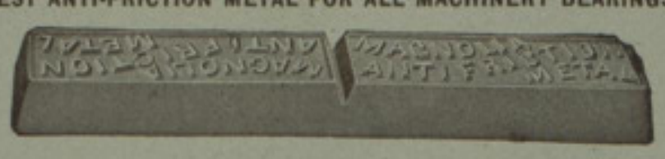

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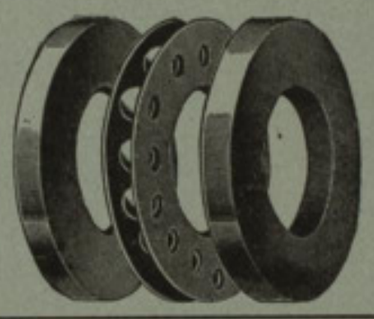

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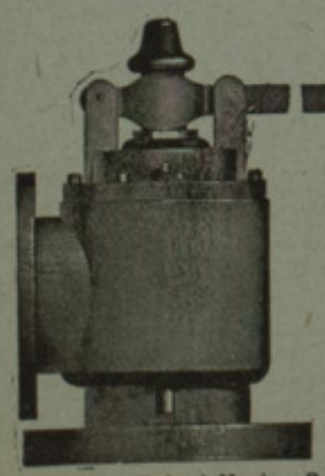

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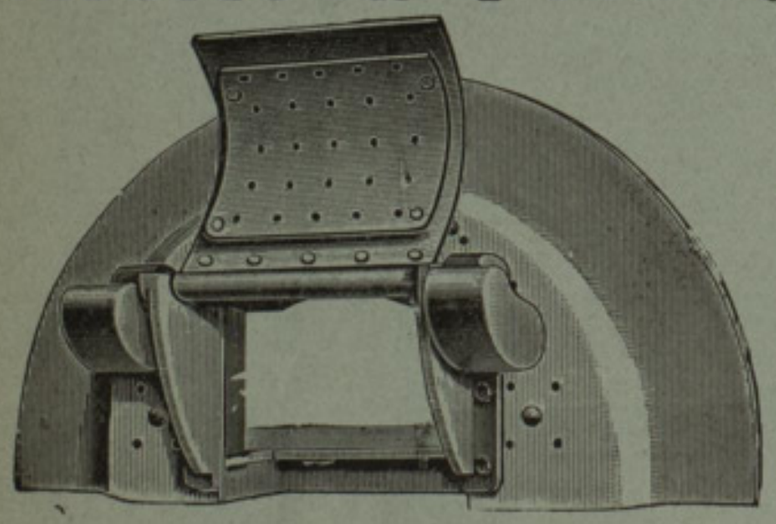

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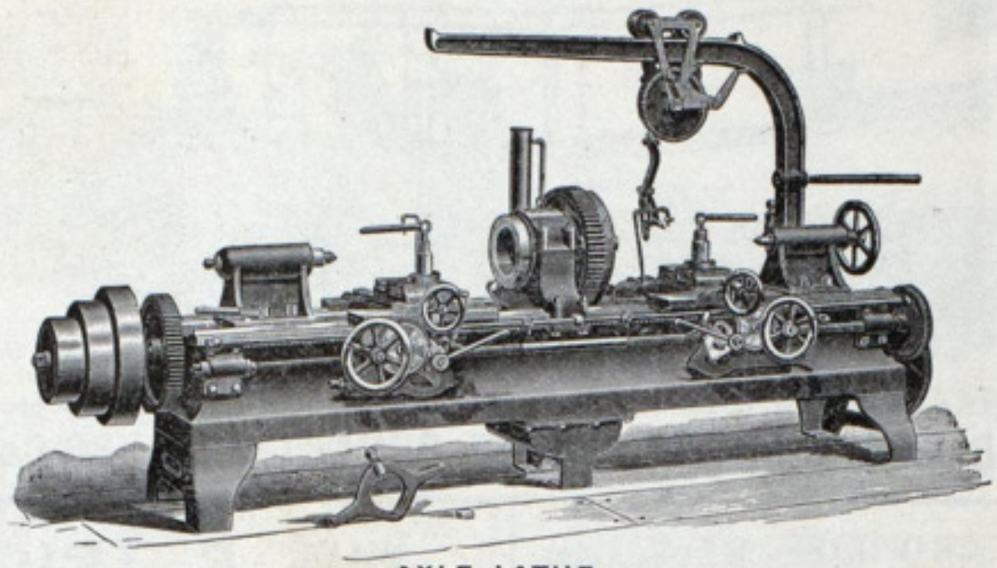

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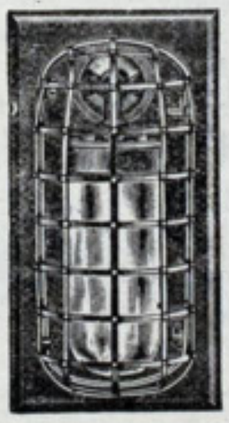

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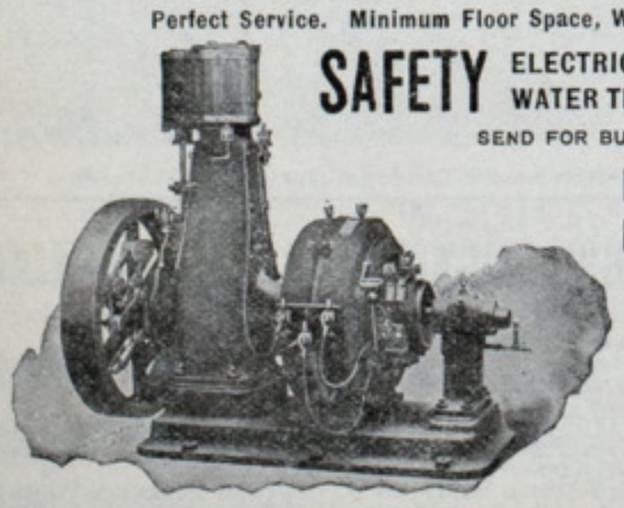

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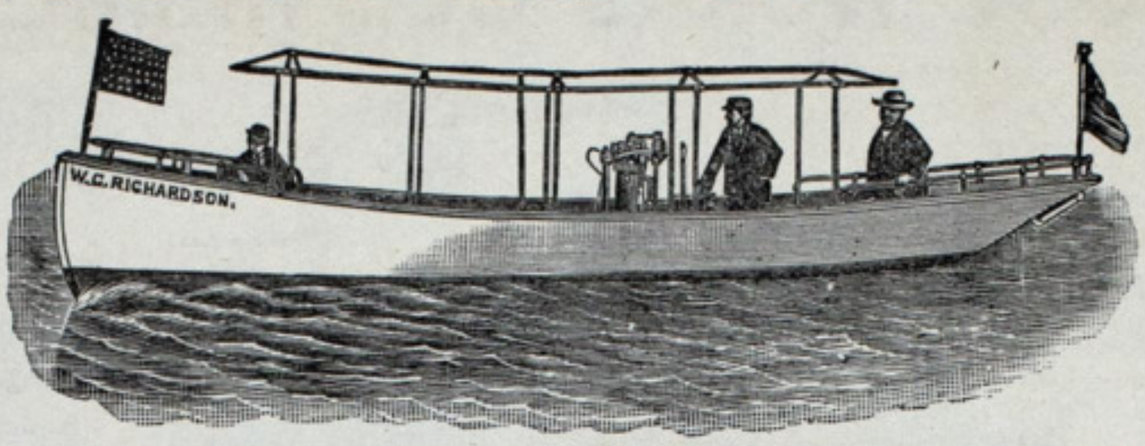

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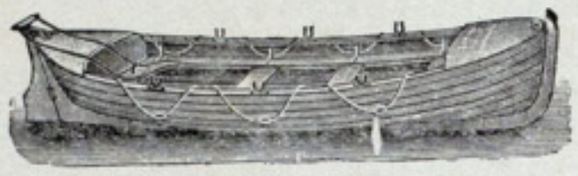

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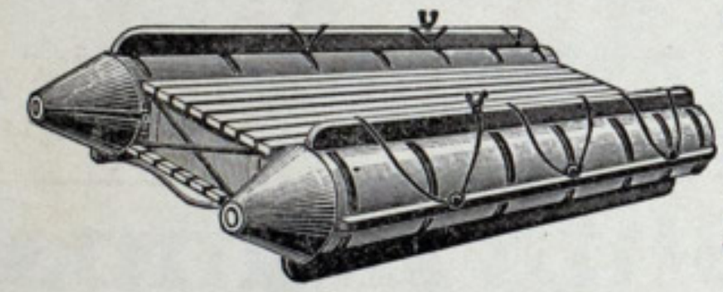

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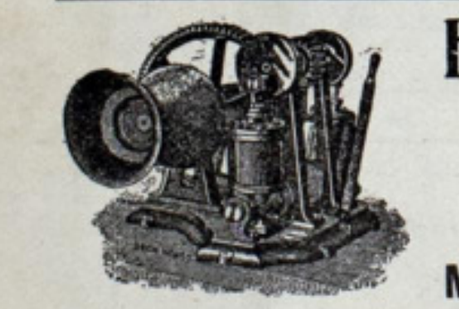

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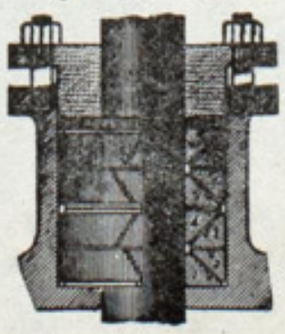

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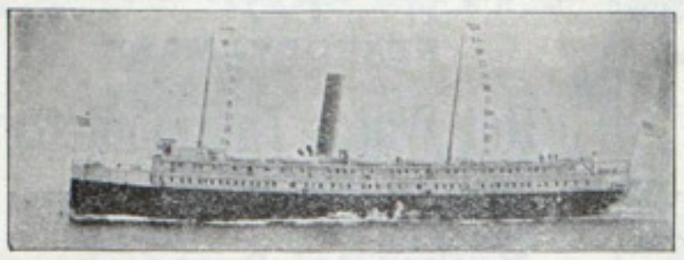

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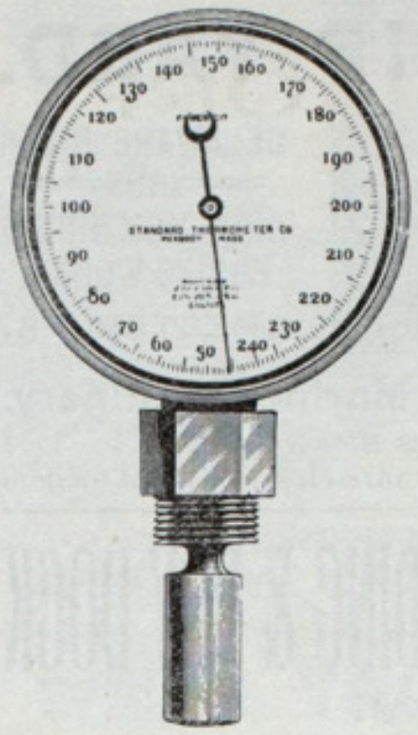

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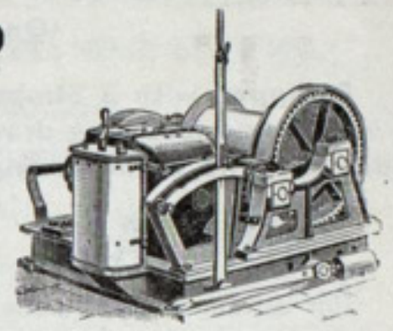

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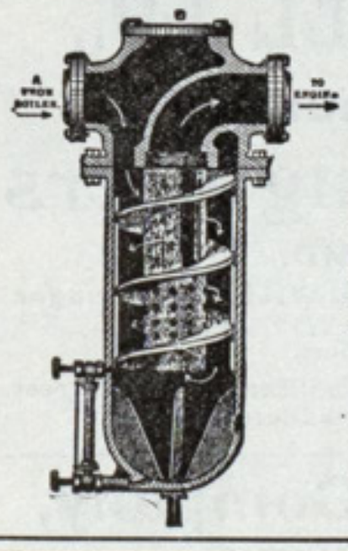

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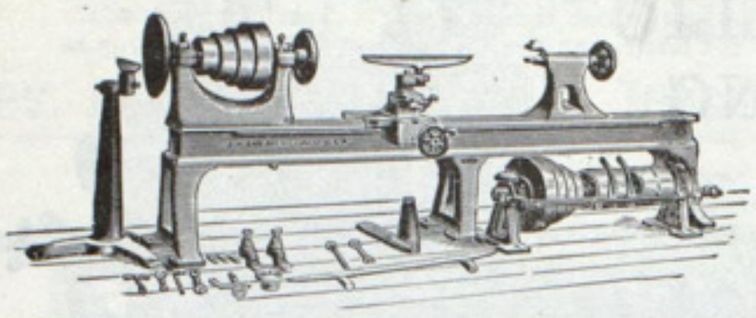

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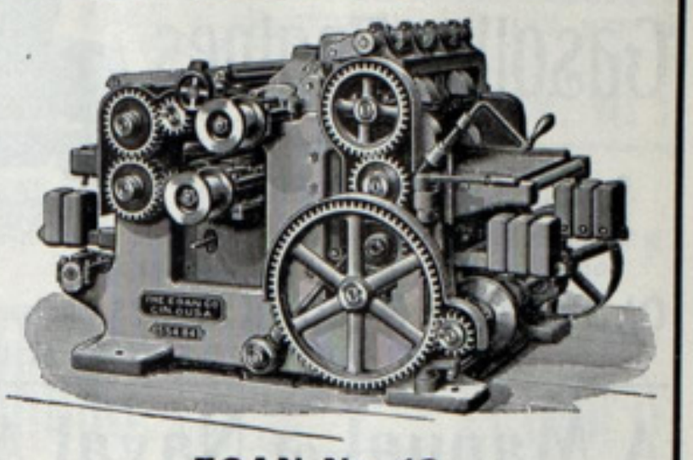

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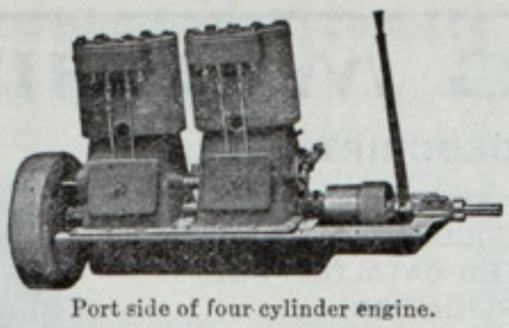

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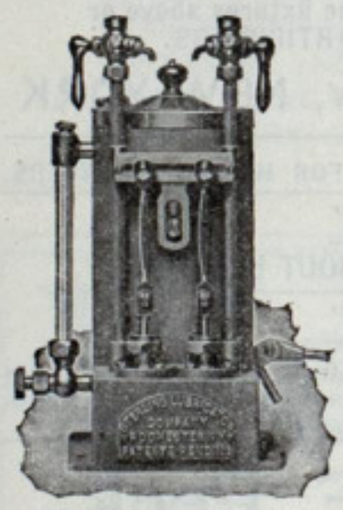

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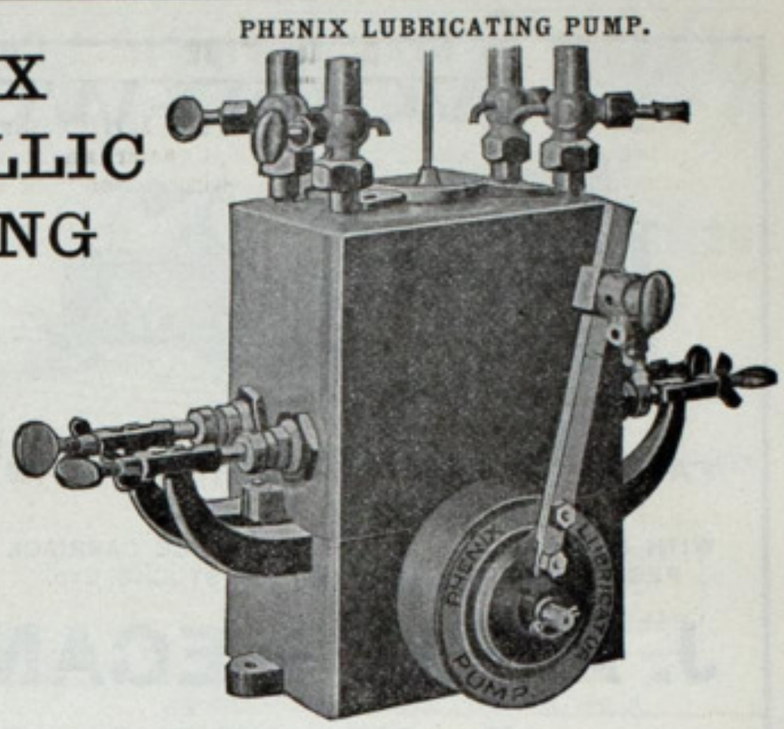

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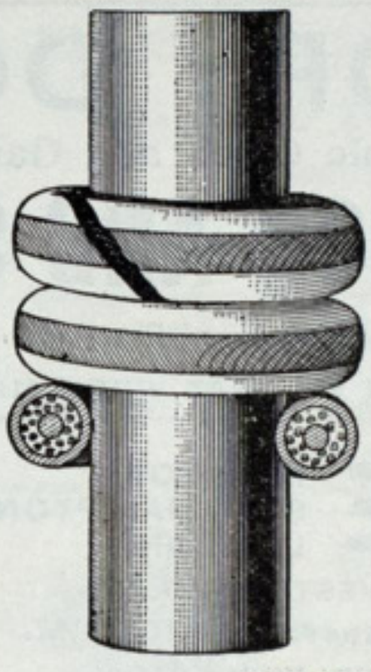

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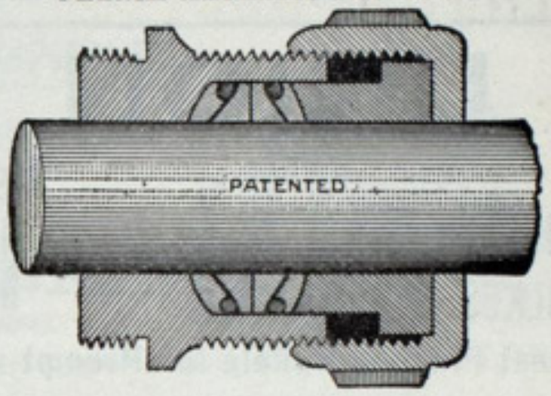

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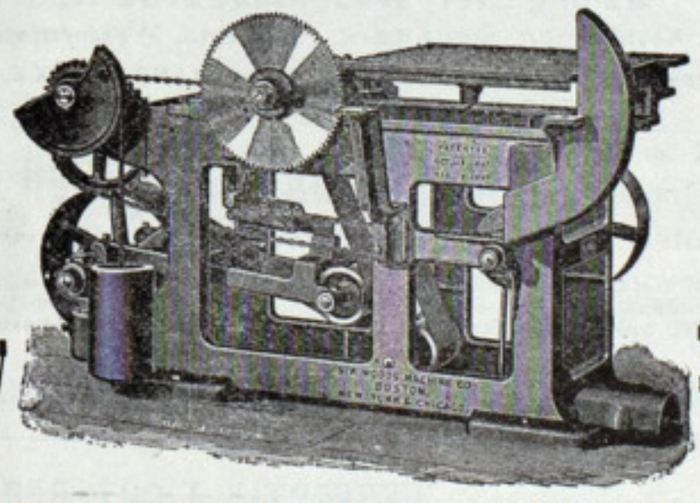

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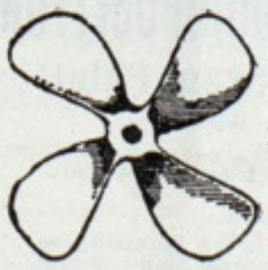

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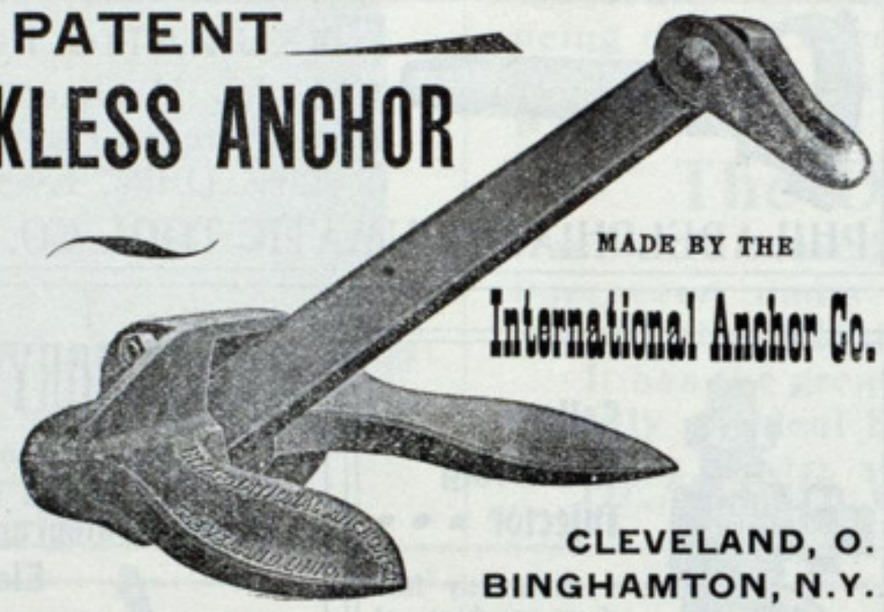

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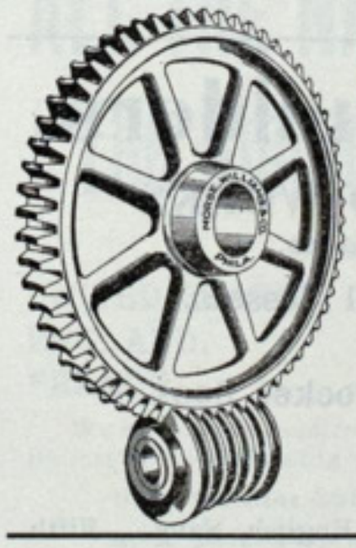

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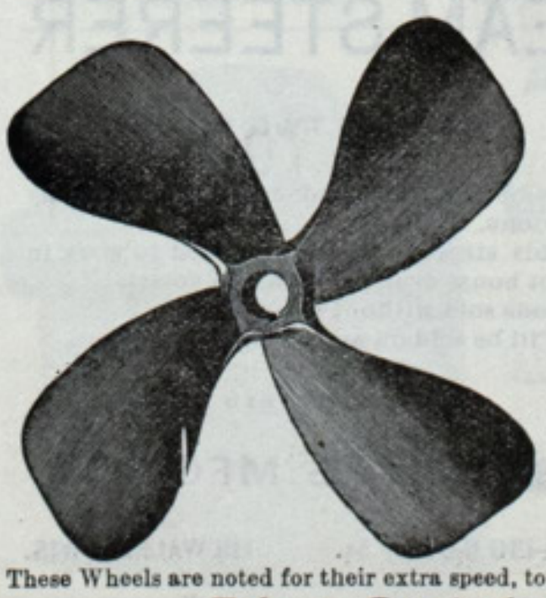

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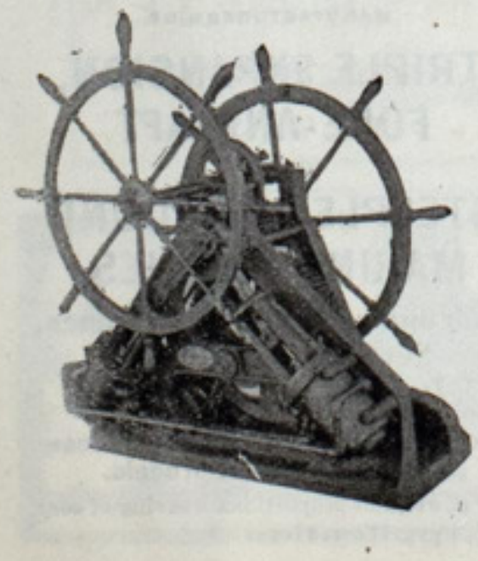

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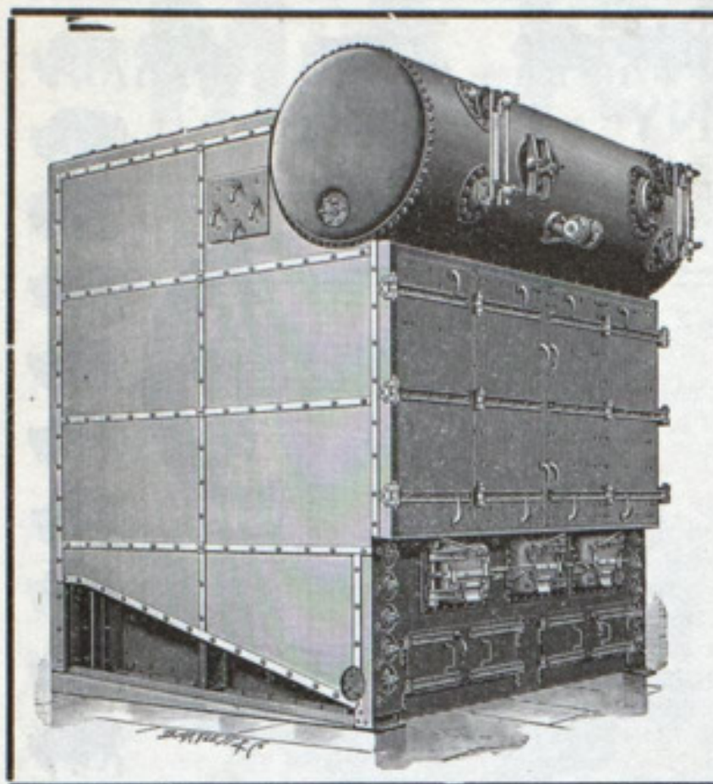

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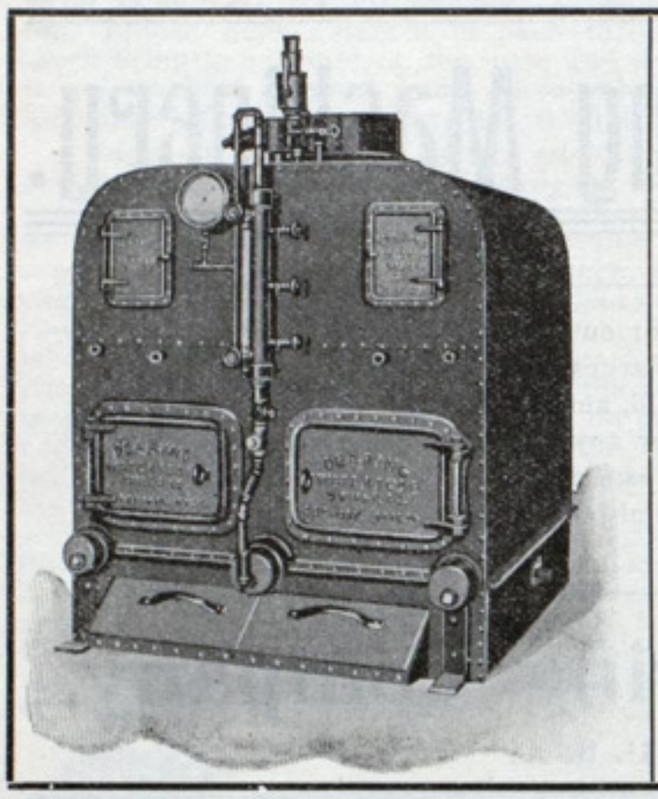

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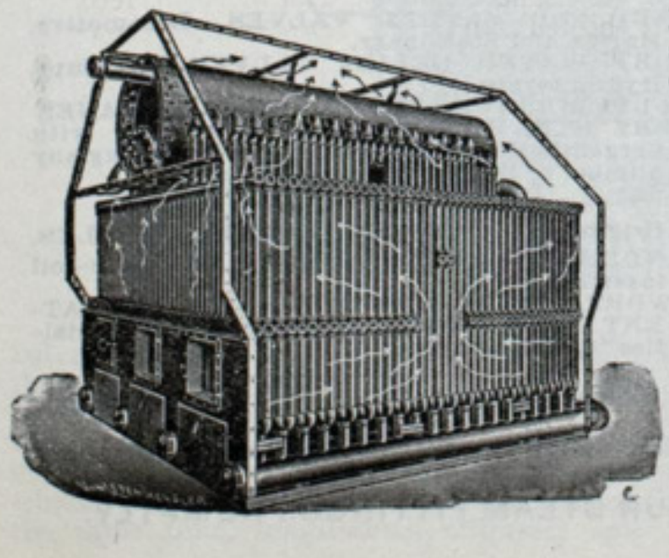

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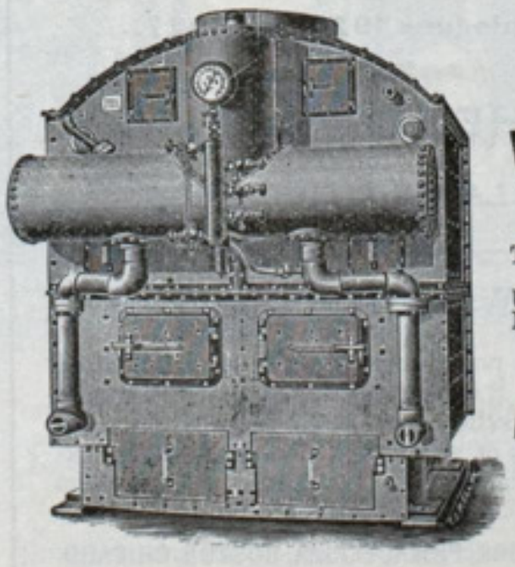

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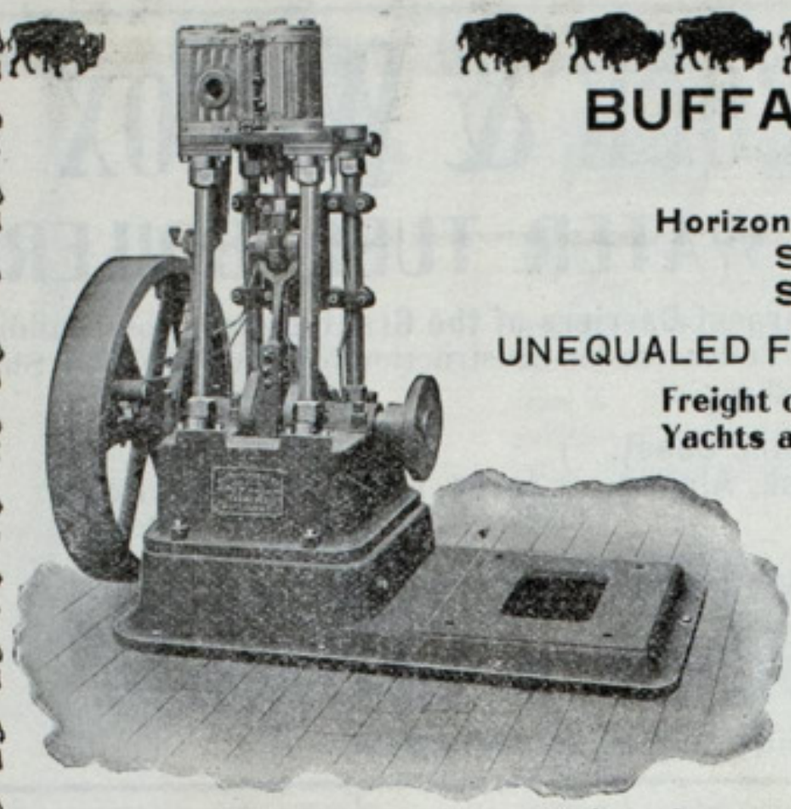

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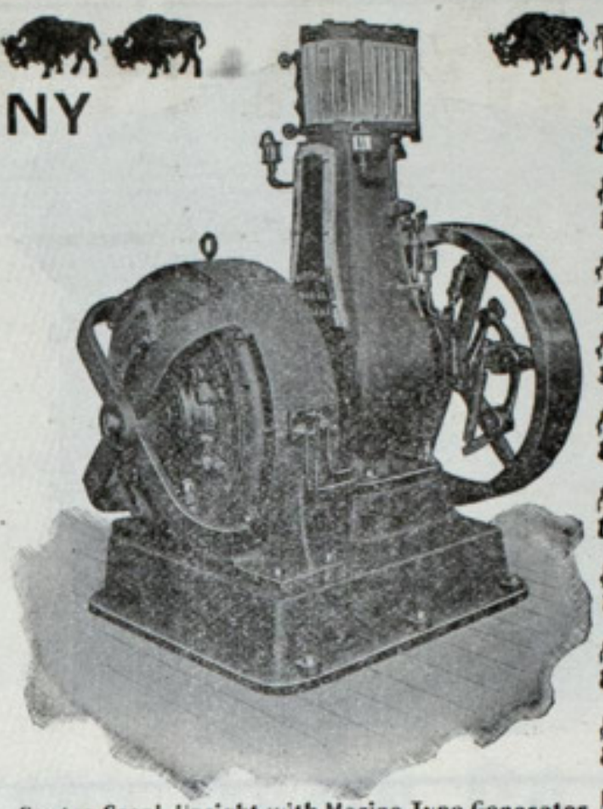
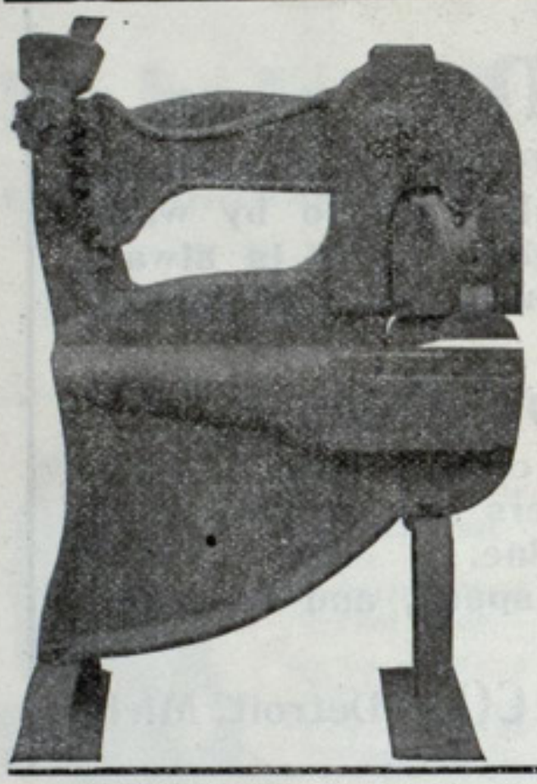


Centre Crank Upright with Marine Type Generator direct connected



Punching and Shearing Machinery.

The illustration shows a machine designed especially for cutting sheet metal. It is a continuous shear made in three sizes. The cut shows the largest size, the No. 4 B. The smallest size cuts up to 3-16-inch sheets, the next size to 5-16, and the machine shown cuts up to ½-inch sheets. They all cut sheets of any width or any length. These machines are shipped complete and ready for use. They are made especially for the use of boiler makers and sheet metal workers. The two larger sizes can also be supplied with a special attachment for beveling sheets.

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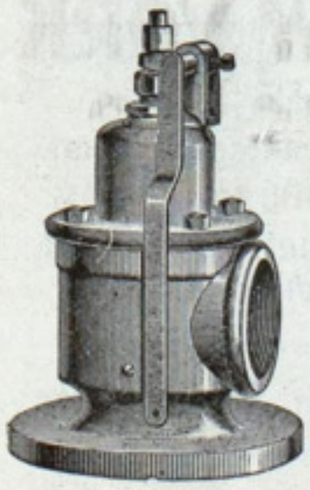

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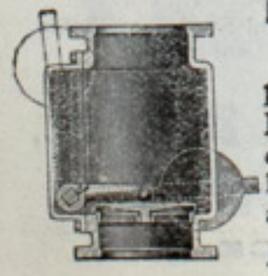

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